SUMMER ENTOMOLOGY. II.*

FIELD AND FOREST INSECTS.

THE day succeeding that on which the butterfly-hunt occurred was a sultry, unbearable day, that forced us to remain within the protecting shade of the piazza or the drooping elms. We did not venture out into the yellow glare of the sun, but made ourselves comfortable within-doors, where Percival devoted a good portion of the day to preparing his recently captured specimens for the cabinet, and in showing me his large and varied collection, which was arranged in exhibition cases in his study. There were seven suites of drawers, for the orders Coleoptera, Orthoptera, Hemiptera, Neuroptera, Lepidoptera, Hymenoptera, and Diptera, and it seemed to me that the doctor had enough representatives of all these orders to satisfy the most infatuated entomologist.

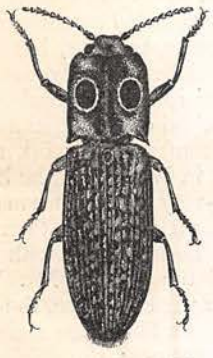

FIG. 1.—EYED ELATER.

The Coleoptera, or beetles, were very numerous, and Percival seemed to regard them with especial interest and favor; he displayed drawer after drawer of them, each with its dozens of specimens, neatly arranged and labeled.

FIG. 2.—GRAY SNAP-BEETLE.

"I never supposed that there were so many different varieties of beetles," I said, after the different groups had been shown, "they vary so in form and color, that if one were not assured they all belong to the same order he would never suspect their relationship."

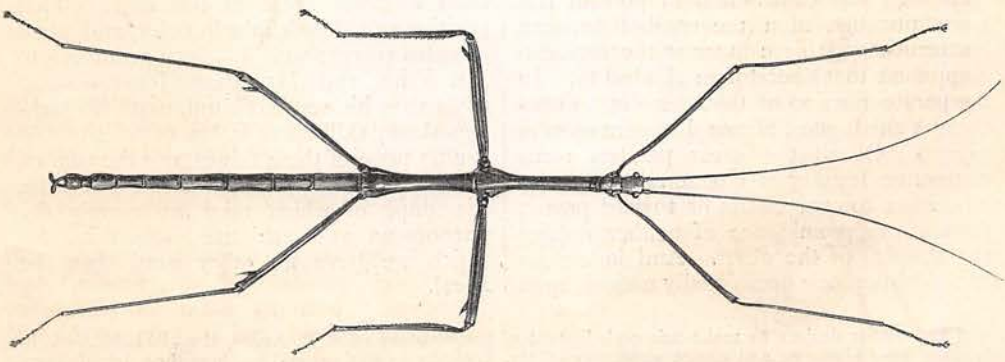

FIG. 3.—THE WALKING-STICK.

* These cuts, and those of moths and butterflies in the preceding paper, were drawn by the late Antoine Sonrel, approved by the late Professor Agassiz, and engraved by Mr. Henry Marsh for Dr. Harris's treatise on "Insects Injurious to Vegetation," published some years ago, under the supervision of Mr. Charles L. Flint.

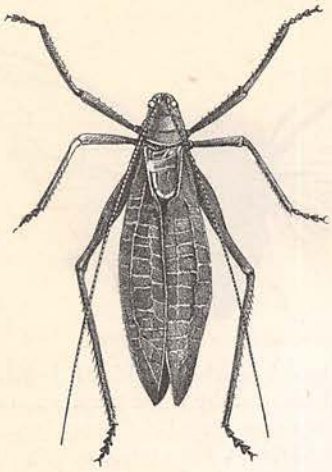

FIG. 4.—THE KATYDID.

"They all possess, in common, characteristics or typical features which prove an infallible guide to the student," replied Percival. "Take this beetle; it has two pliable membranous wings, which are first folded transversely and then longitudinally in a straight line along the back when the insect is at rest; these wings are covered and concealed by two anterior wings, or rather wing-cases, whence the name Coleoptera. These wing-covers (called elytra) do not assist in flying, but are simply shields for the delicate flying wings. The mouth of this class of insects has, as you see, two transverse jaws adapted to cutting; without going into further scientific details, these simple characteristics that I have named are so apparent that one can at a glance separate the beetles from all other insects."

"Yes, I see," I said, after examining

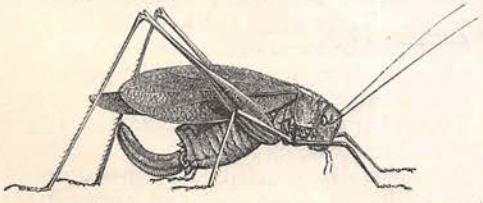

FIG. 6.—OBLONG LEAF-WINGED GRASSHOPPER.

many specimens, "these peculiarities are persistent; but what a variety of forms there are, and what curious lives they must lead."

"Their lives are as dissimilar as their forms," replied the doctor. "Some of them live in the water, others prey upon caterpillars, and a variety of small insects; whole families feed on bones and carrion and manure; others subsist on fungi, while still others live under the bark of old trees. This specimen," he continued, "is one of a very interesting group, the elateridæ. It is called the eyed elater—*Elater oculatus*. [Fig. 1.] It is the largest of all our spring beetles."

The insect was principally black, with a grayish powder covering the thorax above and the legs. On each side of the thorax above was a coal-black velvety spot, sur-

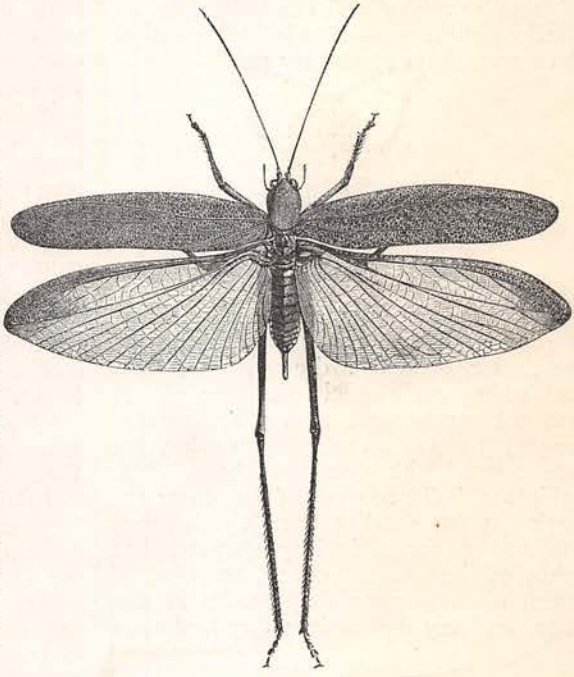

FIG. 5.—NARROW-LEAVED GRASSHOPPER.

rounded by a ring of grayish-white. The wing-covers were marked with fine sunken lines, and dotted and sprinkled with grayish and white.

"Why do you call it a spring beetle?" I asked.

"It receives its name in common with the other members of this family," said Percival, "from its habit of jerking or springing upward, and alighting on its feet, when it has fallen by accident or has been thrown upon its back. Its form being so rounded and its legs so short it could no more turn over than a turtle, were it not for this springing power, which has given it the improper name of 'Snap Bug.'"

"How is this springing act performed?" I asked.

"In a very curious way," replied Percival; "the under side of the thorax is prolonged into a sort of tooth or spine which fits into a kind of groove in the abdomen behind it; when the beetle finds itself upon its back, it folds its legs together, bends its head and thorax downward and backward, so as to withdraw this projecting point from its sheath; it then suddenly and forcibly drives the breast spine into its cavity, and this act gives the body a sort of jump or spring which is assisted by the elasticity of the wing-cases bounding against the surface upon which they rest."

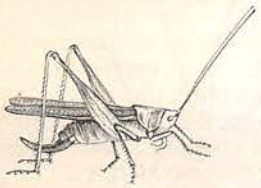

FIG. 7.—SLENDER MEADOW-GRASSHOPPER.

The common gray snap-beetle, *Elater cinereus*, is a very much smaller insect," said the doctor, opening a drawer of the case and taking out a specimen. [Fig. 2.] It was not much more than a half-inch in length; it was of an ashy brown color, and was covered with short gray hairs. "Its habits are similar to those of the other; the larvæ eat the wood in trees in which they live, and are not particularly injurious. The grubs of most of the elaters, however, of which we have some sixty species in this state, are very destructive; they feed upon

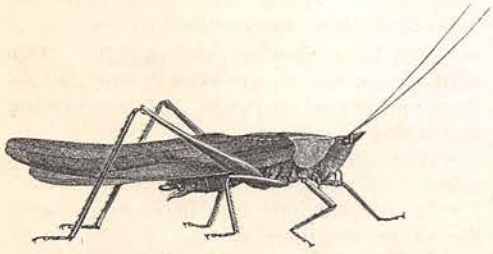

FIG. 8.—THE SWORD-BEARER.

the roots of vegetables and plants, and some are injurious to the roots of corn. These larvæ are often called wire-worms, and are thus improperly confounded with the Iulus, which is one of the myriapods. Such an error is inexcusable, for the iulus has many feet, while the grub of the elater has but six.

FIG. 9.—DOG-DAY HARVEST-FLY.

I have heard of whole fields of Indian corn being destroyed by these vermin; the grub eats through the kernel of the newly sprouted corn, or through the young shoot, and the plant quickly dies. These pests destroy not only the corn, but all the cereals, and even the roots of grass. Harris describes a method by which they are trapped in Europe: sliced potatoes or turnips are strewed in rows through the field; the larvæ come to feed at night upon this bait, and in the morning are easily captured and destroyed. There is an allied species that is found in the West Indies, called the night-shining elater, which has a strong phosphorescent light; it is often kept in a small cage as an ornament or pet."

"But what an odd-looking assortment of grasshoppers and crickets!" I exclaimed, as Percival opened one of the drawers, labeled "Orthoptera."

"Yes," replied the doctor, "and they are as interesting as they are odd-looking. In the Orthoptera are included a very great variety of forms; but they all have well-defined characteristics. The orthoptera," he continued, opening the drawer and lifting a specimen by the entomological pin, "have wings which, when at rest, are folded upon the body longitudinally, presenting a straight line; hence the name, signifying straight wings. These wings also fold together like a fan, and, like those of the beetles, have fore-wings, or elytra, for the purpose of protecting, in a measure, the under-wings when at rest. These elytra, however, are different from those of the beetles, being of a leathery consistency; the wings, also, overlap each other upon the back, sloping downward and outward like the roof of a house, and by this arrangement the males are provided with organs by which their stridulations are made. In addition to these characteristics, the young of the Orthoptera differ greatly from the beetles and butterflies in their metamorphoses, the

young of this order resembling in miniature the parents, but without wings, or occasionally with very small ones. Like the old ones, they move about and eat; and, as I said, they resemble them in miniature."

"And what do you call that in your hand? Not an insect?" I asked.

"It is called the walking stick,—*Spectrum femoratum*," said the doctor. [Fig.3.] "It belongs to the section of Orthoptera, called the walkers. There are four sections in this order, each with peculiar and well-marked characteristics. These sections are called the runners *(Orthoptera cursoria)*, of which the cockroach is a good example; the graspers *(Orthoptera raptoria)*, such as the mantis; the walkers *(Orthoptera ambulatoria)*, and the jumpers *(Orthoptera saltatoria)*, which is by far the largest section, embracing as it does the crickets, grasshoppers and locusts."

"Is it possible that such dissimilar insects as grasshoppers, cockroaches and this odd 'stick' are all classed in the same order?"

"Yes," replied Percival, "they all possess characteristics which separate them from other groups of insects. This walking stick," he continued, handing the specimen to me to examine, "is not uncommon, although from its great resemblance to the twigs on which it rests, it is not often noticed."

The insect was entirely without wings,

FIG. 11.—THE PIGEON TREMEX.

and looked like a brownish twig or stick with six legs growing from it.

"It is far from being a pleasant looking creature," said I. "What does it feed upon?"

"Its food consists of the leaves and tender shoots of trees and bushes. It is a sluggish creature, and does not display much desire for walking. Some of the species found in the East Indies," he continued, "have wings which greatly resemble leaves both in shape and color, and in their branching veins, and hence they are called walking leaves; it is almost impossible to distinguish them from the foliage."

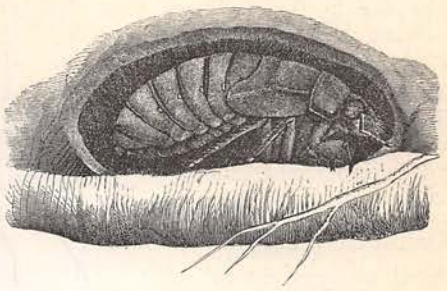

FIG. 10.—THE SEVENTEEN-YEAR LOCUST (FEEDING ON A ROOT).

"How very singular!" I observed. "Dame Nature plays some curious freaks."

"Yes," replied the doctor, "and it has sometimes seemed to me that she has made the utmost effort to produce the fantastic."

Here he took up an insect of a pale-green color, about an inch and a half long, with large wings that enveloped the body of the insect, like the two sides or valves of a peapad. The body of the insect was of a pale-brown color, the elytra and wings grass-green, and the top of the head brownish. It proved to be the katydid—*Platyphyllum concavum*. [Fig. 4.]

"How is its note, 'Katy did,' produced?" I inquired. "I have never clearly understood."

"It is produced by the friction of two thin transparent membranes stretched, as Dr. Harris expresses it, in a strong, half-oval frame in the triangular portion of each wing-cover. These two membranes are rubbed against each other by the insect opening and shutting the wings. This song or music is performed only in the evening and at night, the insect remaining quiet during the day. This species," he continued, taking out another insect with much narrower wings, "is often mistaken for the katydid by amateurs; but, as you see, it is quite different."

"Yes," I replied, "but if one could not compare the two together, it would be an easy matter to make the mistake. What do you call this species?"

"It is the narrow-leaved grasshopper called by Dr. Harris the *Phaneroptera angustifolia*. [Fig. 5.] It does not appear to be very much different in its habits from the katydid. Here is another broad-winged

species," he continued, "which more nearly resembles the katydid; but the wing-covers are narrower, and flat, instead of being concave, as are the katydid's."

"What is the name of it?" I asked.

"It is the oblong-leaved grasshopper,—*Phylloptera oblongifolia*. [Fig. 6.] It lives in trees, like the katydid, and sings somewhat like that insect, though its notes are quite feeble. These three species are placed by systematists in one group; there are a number of other species among the jumpers, some of them being quite numerous. This little fellow," he continued, pointing to a green-winged grasshopper not more than a half-inch long, "is found in the meadows later in the season in abundance; it is the slender meadow-grasshopper —*Orchelimum gracile* [Fig. 7]; and we have still another species,—quite a pretty one, too,—called the sword-bearer — *Conocephalus ensiger*. [Fig. 8.] This is really the typical grasshopper."

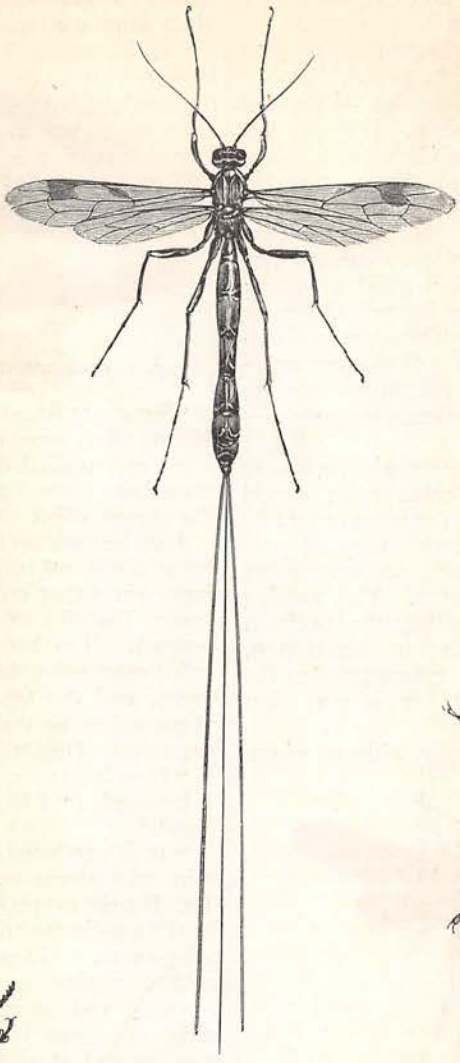

FIG. 12.—ICHNEUMON FLY.

"These last two species," continued Percival, closing the grasshopper drawer, "live upon grass and other low herbage in fields and meadows. They are by no means so numerous and destructive as the locusts and they do not move in swarms as those insects do. They have what is called a shrilling organ, somewhat like that of the katydid, and the males produce sounds or songs by the friction of the overlapping portions, while the locusts, not having this stridulating organ, produce their sounds by fiddling with their hind legs across the projecting veins of their wing-covers. You will easily see," he continued, pulling out a drawer labeled "Locusts," "that while these locusts resemble the grasshoppers generally, they have much shorter antennæ, which, instead of tapering, as with the others, are of nearly the same thickness throughout. They have also much shorter and thicker thighs than the others, and can consequently leap much better. They have much stronger wings, too, and their power of flight is greater and more sustained than that of the grasshoppers."

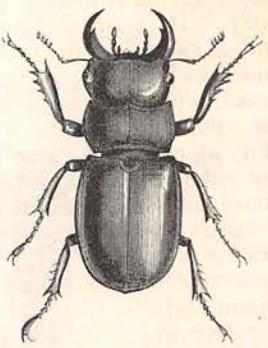

FIG. 14.—THE HORN-BUG.

FIG. 13.—BROAD-NECKED PRIONUS.

The specimen that he displayed was nearly two inches long from the head to the end of the wings. It was of a pale green color, with whitish head, and darker colored legs and abdomen.

"These locusts, I suppose, resemble those that fly in such immense swarms in the West and devour the crops."

"Yes, the species you refer to is called the hateful or Rocky Mountain locust," re-

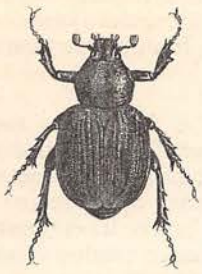

FIG. 15.—ROUGH OSMODERMA.

plied the doctor. "When a swarm of these destroyers is on the flight, darkening the air like a dense cloud, the noise produced by their wings is like a whirlwind."

"By the way, speaking of locusts," said I, "how does it happen that the locust we hear in dog-days singing in the tree-tops never sings on the ground? I do not remember of ever hearing the song of one from anywhere except in the trees. I thought that the locusts made their home in the grass and low herbage."

"They do," replied Percival. "The insect that sings in the dog-days and is commonly but improperly called the locust is not a locust at all; in fact, it belongs among the bugs *(Hemiptera)*, another order entirely. It is an odd-looking insect," he added, taking a specimen from a drawer and handing it to me to examine. This insect, which the doctor afterward named the dog-day cicada, *Cicada canicularis* [Fig. 9], measured about three inches across the extended wings. Its body was black above, and on the under side appeared as if covered with fine dust or flour. The head was short, broad, and triangular, the eyes large and round, and the wings transparent and very thin.

"And why is he a bug?" I asked. "I confess that to my uneducated eyes he looks more like a thick-headed, short-bodied fly."

FIG. 17.—FEMALE OF THE WHITE CLIMBING CRICKET.

"He is not a fly, because he has four wings, while the flies have but two. He is a bug because, with other peculiarities, he has a horny beak for suction instead of jaws for cutting, like the beetles, etc. The song of this cicada or dog-day locust, as the farmers call it, is produced by a very curious organ, or rather a pair of them, situated one on each side of the body, called by some entomologists kettledrums. These instruments, consisting of convex-shaped, parchment-like skins, are arranged in a great number of fine folds or plaits."

"How very odd," I exclaimed, "grasshoppers that fiddle and cicadas that drum; the sound, however, does not seem like drumming, but more like a harsh, shrill scream. How does the insect drum—not with its legs?"

"No," replied Percival, "the sound is produced, not by drumming, but by the

FIG. 16.—SPOTTED WINGLESS CRICKET.

insects' vibrating these parchments very rapidly by contracting and relaxing the muscles attached to them; the sound produced by this wrinkling action is further heightened and increased by a particular conformation of the cicada's body."

"What does the creature feed on?" I asked, after a short pause, as Percival sat down, and began to prepare a number of the insects that we had captured the day before.

"In the perfect stage it subsists upon the juices of trees and plants, which it obtains by piercing into the bark with its beak and sucking. In this stage of its existence, however, it is not long-lived, as it dies in a few weeks after reaching the imago

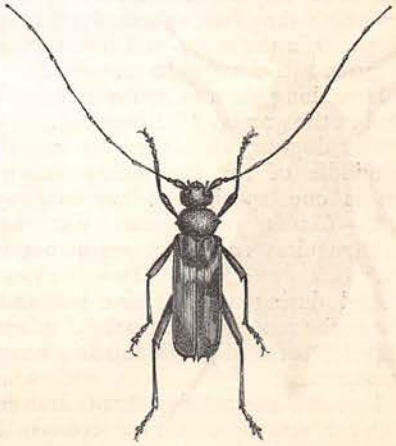

FIG. 18.—BANDED STENOCORUS.

form; it is during this stage of its life that the eggs are laid, and the organization of the insect is admirably adapted to the use for which it was intended. The female is provided with a peculiar-shaped piercer, which is situated on the under side of her

FIG. 19.—PALES WEEVIL.

body in a channel provided for its protection. The piercer consists of two awl-shaped probes; at their ends they are enlarged, and on their outer edges are small saw-like teeth; between these probes is another borer, which plays between them. The instrument thus constructed performs the operation of sawing a hole and deepening it with an awl at the same time. The wood is so penetrated by this apparatus that a sort of lid or flap is formed to cover the perforation. Each hole is large enough to receive from ten to twenty eggs, and these are laid in pairs. The female cicada is prolific, and consequently keeps busy until all her eggs are laid. The young cicada, as soon as it is hatched from the egg, crawls out of the nest, and by a wonderful instinct drops to the earth."

"I thought the cicadas live in trees."

"So they do in the perfect form; but the young bury themselves in the soil, digging down until they reach the root of a tree, upon which they fasten themselves, burying their beaks in the root; and thus they suck and grow, and develop to maturity."

"How long do the grubs remain thus buried in the ground?" I inquired.

"The dog-day cicada comes out about the middle of the succeeding July; but there is one species, the seventeen-year locust,—*Cicada septendecim* [Fig. 10],—which requires seventeen years to perfect itself."

"And during all that time is it sucking away at the roots of the tree?" I asked, as Percival finished his work and laid away his instruments.

"Yes, and the injuries that these vermin inflict are sometimes very serious.——But come, you must have had all the entomological talk you want to-day; let us join Mrs. Percival on the piazza, and get a breath of the fresh breeze that is springing up."

Early on the forenoon of the next day, we started out fully equipped for a beetle-collecting excursion. The doctor bore about him his collecting apparatus, while I carried the luncheon basket, it being our intention to spend the greater portion of the day in the woods and pastures.

Percival soon settled down to his work with all the ardor he had displayed in the butterfly hunt. Old stumps of trees and decaying logs were poked into with knife and probe; rocks and chips were turned over, and every nook and crevice explored. At length we came to an old button-wood tree that stood by itself in an open space in the woods, and as I leaned against its boll, I saw fluttering against the bark an insect that appeared to be fastened in some way to the tree. I pointed it out to Percival, who disengaged the flutterer, and pinned it.

"What is it?" I inquired.

"The pigeon-tremex,—*Tremex Columba* [Fig. 11],—and a great pest it is, too."

"In what way?" I asked. "This is not a vegetable feeder, is it?"

"It is injurious in the larva form," replied Percival; "the female, with her peculiar ovipositor,—which is contained in this sheath that is nearly a half-inch in length,—bores numerous holes in trees, in which she deposits her eggs. From these the larvæ are hatched, and I have known instances of trees being completely riddled and killed by the grubs."

The body of this tremex was about an inch and a half in length. The head and

FIG. 20.—VIRGINIAN BUPRESTIS.

thorax were yellowish-brown, the abdomen bluish-black, and the extremity yellow; the wings were of a clouded brown, and the feet and legs yellowish.

"She has somewhat the look of a wasp,"

said I. "How did it happen she could not fly away?"

"Because she had driven her ovipositor so deeply into the wood that she was unable to withdraw it," said Percival, depositing the tremex in one of his boxes, and preparing to move on; "it is not an uncommon occurrence."

"To which order does the tremex belong?" I asked, at the same time assisting Percival to overturn a huge bowlder. As the stone rolled over, a number of crickets and other creeping things ran about in the cavity, and for a few moments Percival was fully occupied in catching and impaling the various specimens.

"It belongs to the Hymenoptera," he replied at length, wiping the perspiration from his forehead; "in this order are included the saw-flies and bees, wasps, hornets, etc.; in fact, all the stingers and piercers, as they are called."

"I was right then, after all," I said, "in associating the tremex with the wasp."

"Yes," replied the doctor, "and it shows that your eyes are getting educated. The Hymenoptera are easily identified; if you find an insect with cutting jaws, and with four veined wings, and a sting or piercer at the end of the abdomen, you may be sure of the order to which it belongs."

"I suppose the tremex must have enemies," I remarked, after Percival had finished both his description of the Hymenoptera, and the operation of pinning the specimens.

"Yes, fortunately," he replied, "or our forests would be destroyed; the woodpeckers devour great numbers of the larvæ, and the nut-hatches also dig them out; a great many of the grubs are also destroyed by ichneumon flies, one, the *Pimpla lunator* [Fig. 12] being their determined enemy."

"How does this fly manage to reach the grubs when they are boring away into the solid wood of the tree?" I asked, pausing in the shade of a friendly hemlock, and watching Percival, who was busying himself near by in digging off the bark and decayed wood from a fallen tree.

"Oh, simply by depositing its eggs by means of its long ovipositor in the bodies of the larvæ as they are at work in the tree. The pimpla seems to know instinctively where the larvæ are rioting, and the eggs are deposited with certainty in the fat bodies of the grubs. In a short time the eggs hatch, and the new larvæ proceed to feed upon their unwilling foster-parents until they are destroyed."

"There, I've got you now," exclaimed Percival, making a quick dash, and seizing a large beetle that ran out from a chink in the bark.

It proved to be the broad-necked prionus,—*Prionus laticollis* [Fig. 13],—and was a disagreeable-looking specimen. It was of a long, oval shape, black in color, and its antennæ were stout and serrated. "It is the largest species we have among the Prionians," said Percival, "although it is not uncommon. I have but few in my collection. But come, let us move on, there is a delicious spring of water not far from here, where we had better eat our lunch. I dare say you are hungry by this time."

"Well, to tell you the truth," I replied, "I believe I am. There is nothing like moving about in the woods to stimulate the appetite."

Leading the way slowly through the undergrowth, Percival soon entered upon a cart-path in the woods; this he followed for a half mile or so, stopping occasionally to capture a desirable specimen, and securing it in one of his boxes or bottles. It was during one of these halts that he caught a fine specimen of beetle that he called the young roebuck or horn-bug—*Lucanus capreolus*. [Fig. 14.] It was very handsome, of a deep mahogany color, and was about one and a quarter inches in length. Its jaws were formidable, and had on their inner edges a little branch or tooth. This was an injurious species, Percival said,—its grubs living in the trunks and roots of trees, boring through them, and eating their wood.

We also captured a fine specimen of a beetle that he called the rough osmoderma, *Osmoderma scaber*. [Fig. 15.] Its color was a purplish black, and in certain lights it had a coppery or metallic luster. The wing-cases were very rough, in consequence of the innumerable minute punctures that covered them.

"What a great variety of beetles there are!" I exclaimed.

"Yes," he said, "there are catalogues of private collections which number many thousand species. The order Coleoptera is one of the largest: Packard says that the number of living species is between 60,000 and 80,000, and over 8,000 are known to inhabit the United States. But here we are at the spring."

After a most wholesome luncheon, we lighted our cigars, and stretched ourselves for a chat and an examination of our captures.

There were innumerable varieties, includ-

FIG. 23.—DRAGON-FLY, OR DEVIL'S-DARNING-NEEDLE.

ing many fantastic shapes. One of the oddest was an insect that Percival called the spotted wingless cricket,—*Phalangopsis lapidicola* [Fig. 16],—which he had found under a stone, and which he said was rather an uncommon species. It was of a brownish-yellow color, and its back was marked with a few spots of a lighter color; what was most remarkable about it was its entire lack of wings, or even wing-covers. It was altogether a far from attractive creature.

"Its habits I suppose are similar to those of other crickets," I said, "notwithstanding its lack of wings."

"I am not very well acquainted with its habits," replied the doctor. "I occasionally find a specimen hiding in a pile of old rubbish in the woods, and I always save him, for he is handy for an exchange. You know we entomologists have a system of exchanges by which we furnish species common in our own localities to collectors in other sections, receiving in return species that are rare with

FIG. 21.—RED-TAILED ATTELABUS.

FIG. 22.—HAIRY-NECKED LEAF-EATER.

us. It is by this system that we are able to make complete collections."

Another species that Percival had captured on a wild grape-vine was the white climbing cricket—*Œcanthus niveus*. [Fig. 17.] Its body, wings and wing-covers, were of a white color with a faint tinge of yellowish. Percival handled the specimen with considerable care, its body being delicate and tender.

"It is not very common," he observed, "or our fruit-trees would suffer; the female climbs up on the limbs of plum and peach trees, and raspberry vines, and, boring a number of holes, deposits her eggs in the

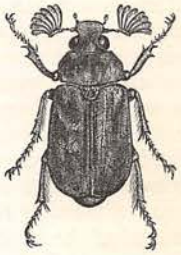

FIG. 24.—SCARRED MELOLONTHA.

wood. It is said that it severs grapes from the vines. The males have a peculiar drum-like apparatus on the wings, which, when played upon, gives forth a loud and shrill music, which they keep up through the night."

Another interesting insect was the banded stenocorus—*Stenocorus cinctus*. [Fig. 18.] It was a handsome beetle of a hazel color, with numerous short gray hairs which lent it a tint of their color. Across each wing-cover was an oblique bar of yellow ocher. Its antennæ were about twice the length of the insect's body. Percival seemed to prize the specimen very much, for it was a species he said, not often captured by collectors, and then usually later in the season.

"The larva of this species," he said, "lives in the hickory, through the trunk of which it bores and forms long galleries; often these larvæ continue in the wood even after it has been manufactured into furniture,

and they continue boring and excavating until the wood-work has been sadly perforated. In such instances I have found the larva in good health and condition."

A curious insect that he handed me for examination was a species that he called the Pales weevil—*Curculio Pales*. [Fig. 19.] He had found it with others, he said, on the bark of a pine-tree. It was a little over a half inch long, of a deep chestnut-brown color, and the wing-covers were thickly and irregularly marked with small spots of light yellow. Its snout was lengthened, a characteristic of all the weevils.

"This species in the larva form is terribly destructive to pine-trees," said Percival. "Instances are on record of whole forests being killed by them. They live under the bark next to the wood of the tree, and, eating the tender inner bark, completely girdle the tree. There are already known upward of 10,000 species in the Curculionidæ, to which family this weevil belongs, and they are all injurious. Some subsist on the pith of trees, others on the wood. Some live in the roots, some in nuts, and others in fruits and seeds. The mischievous plum-weevil, the grain-weevil, the pea-weevil, and others are all allied species, and the damage they do annually cannot be computed."

"Here is a handsome beetle of a quite different group," he added, "the *Buprestis Virginica*. [Fig. 20.] It is also very injurious to pines. Its larva bores in all directions in the wood of the various pines and causes great damage."

The beetle was nearly an inch in length, and its color was a dark brown, with coppery reflections. The wings were marked with a number of sunken parallel lines. On the thorax were three raised lines of black, and on the wing-covers were several black streaks or lines.

"The Buprestians are all injurious, in a greater or less degree, to forest and fruit trees," said Percival. "The eggs are deposited upon the outside of the trunks and limbs, and the grubs, when hatched, work their way through the bark to the wood, which they soon penetrate. It takes a number of years for many of the species to mature, and consequently these grubs have an extended time for mischief."

"Is there no way of stopping their ravages?" I inquired.

"Yes, nature has provided a measure of relief by the creation of numerous birds that subsist upon the larvæ and eggs of these insects. Were it not for these our trees would be terribly endangered. Farmers can protect their fruit-trees in a measure. If they will periodically examine the trees, and, when the burrows of the larvæ are found, thrust a sharp-pointed, pliable wire into them and kill the grubs, they can keep their numbers down."

For some moments I had been idly watching a dragon-fly that had been darting about on nervous wings. Suddenly a small butterfly appeared through the bushes and hovered toward the dragon-fly. It was a fatal act, for the other insect, seeing the gayly painted interloper moving through the air, made a fierce dart, and in an instant settled upon a stump and commenced devouring its prey.

Percival, whose attention had been called by me to the incident, seized his net and in a trice had the dragon-fly struggling in its folds. It proved to be the beautiful dragon-fly, *Libellula pulchella* [Fig. 23], and was a remarkably handsome specimen. The color of its body was a reddish-fuscous. On the sides of the thorax were two oblique yellow stripes, and the abdomen had a yellow stripe on each side. On each of the wings, at its base, middle, and end were three spots of a dark, smoky color. Its extended wings measured about three and a half inches.

After I had examined the insect all I wished, Percival opened his net and permitted the struggler to escape.

"I always let these fellows pass," he said, "for they are great insect-eaters, like the other Neuroptera. If it were not for them we should be completely overrun with injurious insects. Nature has made wonderfully wise provisions. She has created whole races of animals, apparently to keep in check the insect hordes which by daylight and dark are working to the injury of mankind, preying as they do upon all forms of vegetable life. Among the insect-destroying animals none are more interesting and valuable than the bats; their peculiar organization adapts them exactly to the pursuit of insects in the air at night. As you know, most of the moths and other injurious flying insects are active only at night, remaining during the daytime hidden in out-of-the-way cracks and corners. For instance, the May-beetle or 'Dor bug,' as it is commonly but improperly called,—that disagreeable droning buzzer that flies into our rooms when the lamps are lighted,—is active only at night. You can form no conception how destructive

the larvæ of these beetles are; hundreds if not thousands of acres of mowing and grass lands were last summer destroyed by these grubs in Massachusetts alone. They work under the sod, eating off the roots of the grass, and killing it, so that the whole sward may be rolled up like a piece of carpet. Destructive as they are with all their enemies active against them, it would be impossible to say what would be the extent of their mischief if their great foes, the bats, that destroy myriads of them in the beetle form were exterminated."

"I never supposed that bats were of much importance in the economy of nature," said I, carelessly.

"Indeed they are of great importance," replied Percival; "not only beetles are eaten by them, but great numbers of moths. As I said before, the bats are actively at work at night; in the day-time multitudes of birds and quadrupeds and predatory insects are destroying the insect pests. The birds are especially active in this work, and apparently in order that it may be the more thoroughly done, different races of the feathered tribes have been created, each with its own particular sphere. The blackbirds, thrushes and larks devour the insects which infest the grass crops and other vegetations near the ground; the creepers, titmice and others eat the insects which are found on the limbs and bark of trees both in the larval and perfect forms; the woodpeckers destroy the borers in the wood of trees; while the warblers, cuckoos and orioles capture the insects and caterpillars in the foliage. The fly-catchers are busy through the day, and the night-hawks and whip-poor-wills in the night capture the flying insects near the earth; while the swallows are on the wing from daylight until dark, securing those insects that have escaped their other enemies."

We spent a half hour longer at the spring, and then started in the direction of home. Percival kept at his work steadily, knocking off pieces of bark from dilapidated trees, rooting out old stumps, and rolling over old logs and stones and rubbish. His collections were, as usual, numerous.

Percival found upon the foliage of an oak-tree a number of specimens of a beetle that he called the red-tailed attelabus—*Attelabus analis*. [Fig. 21.] They were little fellows, not over a fourth of an inch in length; their color on the thorax, abdomen, and punctured wing-covers was a dull red, while the head, antennæ and breast were blue-black.

He also caught another insect that he called the hairy-necked leaf-eater—*Phyllophaga pilosicollis*. [Fig. 22.] It was a beetle a half inch in length, of a yellowish-ocher color, and covered with short hairs.

"It is not a particularly interesting species," said Percival, "but it is worth saving. Dr. Harris says that the different species of attelabus roll up the edges of the leaves of trees, thus forming thimble-shaped nests, in which the eggs are laid and the young hatched."

Another beetle, of which he captured but a single specimen, was the scarred melolontha—*Melolontha variolosa*. [Fig. 24.] It was a rare species in that neighborhood, and Percival was quite elated at finding it. The color was a light brown, with a number of whitish spots on the thorax and wing-covers, and its antennæ consisted of seven narrow leaves, of a yellow ocher tinge. It was an interesting species, and the peculiar formation of its antennæ gave it an odd look.

"This species," said Percival, "feeds upon the leaves of fruit and forest trees, but does no great injury."

We had now arrived at the house and entomology was put aside for other themes. My two days of tramping with Percival were not, however, the last of my researches in this delightful department of study. As I write, the mercury is slowly rising in the thermometer, and its approach to a certain figure will soon be my justification in stealing away from city work for a few days' rambling with the doctor in the woods and fields of Willowdale.