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THE NATURAL HISTORY OF COSSUS CENTERENSIS.

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Although *Cossus centerensis* has only recently been discovered, it must have existed for many years in the vicinity of Center, N. Y., its present home. More than twelve years ago, while riding in a Central R. R. coach, I noticed certain species of Poplar, the central shoot of which had perished from causes then unknown; later, while on an Entomological tour near the same place, I found a group of the *Populus tremuloides* which were similarly affected, as were also many other trees of the same species in the vicinity.

On closer inspection many perforations were found in the trunks of these trees, some of which were of recent origin, but nothing then was discovered to explain the cause and consequent unhealthy condition of this species of timber; several times each year afterwards this group of Poplars was examined, but nothing definite was learned until during the month of July, 1876, when a brittle pupa-case was found protruding from one of these openings. This gave a clue which revealed the true nature of the destroyer of this woody growth. On the 10th of June, 1877, a fresh pupa-case was discovered, removed and examined, but the *Cossus* could not be found, although probably resting upon the tree at that time.

It now remained for the youthful and keen eyesight of my son, Theodore P. Bailey, to discover the imago. The facts as related were communicated to stimulate him to vigilance, and the trees were examined daily, every foot of them being closely scrutinized. June 14th of the same year he found a fresh pupa-case, and but a short distance from it a male *Cossus*, which had apparently just emerged. This insect was given to Mr. Lintner, who subsequently described it in the CANADIAN ENTOMOLOGIST. I am now enabled to add a few facts in reference to the natural history of this borer, to give a description of its earlier stages

which have hitherto been unrecorded, and have also added a more minute description of this interesting moth. The accompanying lithograph represents the insect in its different stages, life size. This season (1878) beautiful specimens of both sexes were obtained during the month of June, from which our illustrations were made by Paul Riemann, a naturalist and artist. During 1877 the majority of examples obtained were females; during 1878 the reverse was the case, as males largely predominated.

It was ascertained that the time for the *Cossus* to emerge was from dark to early morning, or between the time of the setting and rising of the sun. Every day the empty cases were removed, and by counting them it was known how many to expect to find, which aided the collector much.

As might be expected from the aborted tongue, this *Cossus* is not attracted by sugar. The trunks of the trees from which they emerged, as well as neighboring trees, were sugared extensively during the time of their appearance, but not one came to taste the bait. During this process, in examining the sugared patches, the light from the bulls-eye lantern was thrown repeatedly upon the surface of the Poplar trees, and several were observed at different times in the act of emerging.

Just before the final transformation the pupa renews its efforts and pushes itself through the thin bark that has been allowed to remain by the larva. It pushes itself through the opening as far as the base of the abdomen, when, after a while, the exposed pupal skin becomes dry and splits, and the moth escapes, climbing up the bark of the tree, shaking out its wings until developed. The moths usually select the end of a dead and broken limb or protuberance of the roughened bark to rest upon, which their color so closely resembles that it is exceedingly difficult to discover their whereabouts.

The empty pupa skins remain at the entrance of the tunnel. The moth itself at first is rather sluggish, and can be captured readily on the bark of the tree in which it has passed its immature state. The moth is very liable to "grease," consequently it is advisable to let it thoroughly dry before capturing and pinning. The cavity of the abdomen should be stuffed, and a few drops of benzole previously put in the cavity or placed upon the material used as stuffing.

The chrysalids vary much in size, some of which are infested by an ichneumon fly, which preys on the caterpillar. A pupa was observed endeavoring to make its way to the surface of the bark, but seemingly unable

to extricate itself, when assistance was rendered by enlarging the orifice. It was laid in a paper box for hatching; a few days afterwards many minute ichneumons were observed resting upon the wall near the box; on examination they were found to be escaping through minute holes in the pupa, which would barely admit a No. 3 Entomological pin. Fifteen of these perforations were counted in this pupa. I presume that the larva of the *Cossus* is pursued in its burrows by the parent parasite. If so, it is curious that the *Cossus* pupa is not killed by the parasites until it has worked itself up to the mouth of the tunnel, thus allowing the ichneumon flies to escape outside.

October 14th, we visited the trees which were known to be inhabited by the *Cossus*, for the purpose of obtaining caterpillars in the different stages of growth. A section of a tree measuring nearly four feet in length was taken, and from it six caterpillars were secured, two of which were occupying pupal cells preparatory to transformation. Judging from the difference in the development of the caterpillars taken at this time, it would seem as if it would require at least two years for their maturity.

While thus far the Center locality has proved to be the chief home of this *Cossus*, it will undoubtedly be found elsewhere wherever the *Populus tremuloides* is found. Several pupa cases of this species have been found in the corporate limits of Albany. Usually trees of less than one foot in diameter are attacked, although in one instance a pupa case was found in a tree measuring sixteen inches in diameter.

The larva, taken October 14th from its burrows, is 45 mil. in length, of a pale flesh color. It is a little broader anteriorly. The prothoracic segment is blackish brown above, the dark color edged with a dirty orange shading. The head is mahogany brown, shining, slightly roughened. The mandibles are black, with three strong teeth. The surface of the head gives rise here and there to single scattered hairs. The antennæ are three-jointed; the second joint gives rise to a single long hair. The 7th, 8th, 9th and 10th abdominal segments are provided with false feet. The segments are marked with a lateral row of brown dots above the reddish stigmata, and there is a row of similar dots, two to a segment, on each side of the dorsal line. These dots give rise to single pale hairs. The larva moves with freedom either backward or forward. The burrows which it excavates are about 15 millimetres in width, and terminate in the pupating cell, which is about 40 mil. in length, smooth; the extremity towards the opening is closed by a wad of finer and then coarser filings

of the wood. The coarser splinters are *not* detached entirely from the wood, but are split up by the larva all around the top of the cell, and project like bristles, appearing somewhat as those wooden toy-trees which are made for children, and which are formed by shaving down the wood and leaving the shavings still adhering by one end. These splinters make a firm wad. Against them are piled a quantity of finer chips or thin filings, which are loose, but pressed together.

The cell is about 40 mil. from the outer bark of the tree, and the chrysalis makes its way to the air through the burrow by means of its teeth on the segments and the spinose process on the front, by which it forces itself, by stretching and contracting the abdomen, through the wood scrapings which close the cell, until it comes to the end. We have noticed a fine thread of silk proceeding from the spinneret of the larva, although in the puparium we have found no silk whatever. The puparium seems to have been formed by wedging first coarser, and then finer strips of the wood together, and seems to be merely a more carefully and smoothly finished enlargement of the original burrow.

A specimen of the pupa which I have examined is about 30 mil. in length, narrow, brownish black, shining, rugose. The clypeus presents a strong broad spinous process, supported at base by lateral projections. On the underside it descends into a wide sulcation, terminating in a broad projection. The caputal appendages are visible, and here and there arise isolated hairs as in the previous stage. The abdominal segments are provided with teeth over the dorsum, decreasing in size to the stigmatal line. The anal segment is provided with two unequal sized terminal teeth on each side of the vent.

The moth seems to belong to the genus *Cossus* Fabr., and not to be congeneric with *Xystus robinia*. The head is short, eyes naked, labial palpi small, appressed, scaled. The thorax is thickly scaled, the scales gathered into a ridge behind, and is squarer in front than in *Xystus*, not so elongate, or so elevated dorsally. The male antennæ are bipectinate, the lamellæ short, rather broad and ciliate. The female antennæ are serrated. It is allied to the European *Cossus terrebra*, while a larger insect. It differs from *C. querciperda* by the absence of any yellow on the male hind wings, and by its darker color and closer reticulations.

In color this species is black and gray; the edges of the thorax and collar are shaded with gray—more noticeable on some specimens than others. The primaries are covered with black reticulations, which are not

always identical in their minor details in different specimens, nor sometimes on both wings in the same specimen. Beyond the cell there is a transverse continuous line, broader than the rest and outwardly bent over median nervules. The ground color is blackish over nearly two-thirds of the primaries from the base, and outwardly gray. Hind wings rounded in both sexes, with blackish hairs at base, pale and sub-pellucid, with short gray fringe, before which there is a narrow blackish edging. The abdomen is blackish. The males are smaller than the females. The smallest male expands about 40, the largest female over 60 millimetres.

A female, after being captured and pinned, deposited three eggs, which were clothed with scales of the same color as those of its abdomen. The females possess a long ovipositor, with which they place their eggs securely in the deep crevices of the bark of the same species of tree from which they emerge. In due time the worms are hatched, and although very small, are soon able to bore into the tree, never apparently ceasing to eat and extending their tunnels through solid wood, first in the alburnum and then through the heart, their burrows increasing in size as the larva increases, until the latter are completely grown. In consequence of the innumerable tunnels cut in feeding many trees are destroyed.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KY.

LAVERNA.

L. Murtfeldtella Cham.

Miss Murtfeldt favors me with the following notes upon the larva of this species: "It feeds in the flowers of the *Oenotheras* both wild and cultivated, and is especially destructive to *O. Missouriensis*, which is now extensively cultivated. The eggs are laid singly on the sticky surface of the calyx, and the larvæ, as soon as hatched, make their way to the centre of the bud and feed upon the petals and stamens. The full-grown larva is $\frac{1}{4}$ inch in length, cylindrical, tapering slightly posteriorly and anteriorly.