

secretes an enzyme capable of changing starch to sugar, and has also demonstrated the presence of salivary glands opening externally in *Philonix nigra* Gillette and *Amphibolips confluens* Harris. We may conclude, then, that at least one enzyme is present in the salivary secretion of the larvæ of the Cynipidæ and that this acts as a pre-digestive ferment on the contents of the nutritive zone. By its action, starch is changed into a readily soluble substance, and is consequently readily absorbed by the digestive tract of the larva. On account of this amylolytic ferment in the larval secretion the nutritive zone will become stored with an unusually large amount of available nourishment which can diffuse to all parts of the gall. The material thus prepared supplies nourishment for both the larva and the gall. The protoplasm of the latter is thus rendered unusually active since it receives an abnormal quantity of available food material in a limited area. The hypertrophy and cell proliferation and probably also the appearance of vestigial tissue, or other primary characters, are, in my opinion, the response of the protoplasm of the host to the additional food supply.

CHRYSCMELIANS OF ONTARIO.

BY F. J. A. MORRIS, PORT HOPE, ONT.

The title of my paper may be misleading to some of you, and I should like at the outset to explain my attitude. It is simply that of a nature-lover led (more or less by accident) to collect some of the insects observed by him about trees, flowers and leaves, while roaming about the countryside with what Wordsworth calls "a heart that watches and receives."

Of technical knowledge I have little or none to offer, and my interest in the economics of Entomology is subject to prolonged fits of catalepsy; indeed, I doubt if it has ever shaken off this blanket of suspended animation sufficiently to appear in really stark-naked wide-awakeness. The fact is, an amateur collector is drawn chiefly by the giddy pleasure of the eye; most of the time he goes about craving new specimens, probably those of large size and bright colour; he is an enthusiastic and irresponsible schoolboy, easily pleased, easily deceived. I knew a collector once in England—I should have called him then, in my ignorance, an old man—

November, 1913

he certainly had grey hairs in his head—a respectable married man and a regular church-goer, but alas, gentlemen, a lepidopterist in an advanced stage. He greatly coveted specimens of the swallow-tail butterfly. This is almost extinct in Great Britain, though still occasional in the fens of Cambridgeshire; the made-in-Germany kind that are exported from the continent to English dealers, ready set and pinned, did not satisfy him, and at last he was obliged to compromise matters by rearing some imported larvæ and liberating the imagoes in his back garden, in order to catch them again with his butterfly net. Now, what is that but childish make-believe? Unfortunately, most of us left this faculty of self-deception behind in the nursery and are incapable of hoodwinking ourselves so easily. Yet I confess to a greater liking for my specimens of Asparagus Beetle since I took them on wild plants that were not growing in a garden, and I never really loved the Potato Bug and the Squash Beetle till I caught them on my side of the farmer's fence, the one feeding on the Bittersweet and the others on the blossoms of the Goldenrod.

Moreover, were it not that such a consummation would jeopardize the existence of one of the world's lilies and eventually defeat its own end, I'd sooner see every stalk of asparagus in my own as well as in all my neighbours' gardens devoured by either species of *Crioceris* (both, perhaps) than invent or discover an insecticide that should prove fatal to so pretty a beetle.

It is, I admit, bearding the lion in his den to appear before an audience largely composed of economic entomologists and talk from so alien a point of view as this about Chrysomelidæ of all insects in the world; for in the whole order of Coleoptera this is probably the one family that most violently flaunts its existence before the public eye, by the invasion of the kitchen garden.

Is there such a thing as a beetle-fancier, I wonder? If there is, that's what I am, and to show you that I have the courage of my opinions, I invite you all as fellow-members of this Society, or as guests interested in insects, to join me in a cross-country tramp north of Port Hope on a fine day about the middle of July. We shall start from our honoured President's old home of Trinity College School, and in order to enjoy the day thoroughly I'll ask each of you for a little while to fancy yourselves back at school

once more—throw away the burden of years and the cares of a responsible position; drop the handle from your name, college degree and the rest of it—forget it all. What you want is a little zest for the day's captures and (as we shall be out for the day) a sandwich or two in your pocket against the noontide hour.

We have green lanes and fields right at our door, but as our road will in any case be a long one, we shall condescend to get a lift by boarding the morning train for Peterborough and riding as far as Quay's Crossing, five miles up the track. I am giving myself as well as you a treat, for this is a favourite walk, and I may not have many more opportunities of taking it. But for all the hundreds of times that I have trodden these paths and roamed the woods and fields, I do not think I have ever come out entirely or even primarily as a Coleopterist. The countryside all means far more than beetles to me, so I must ask you to pardon the digressions, which may be many. I hope they will not weary you.

During the few minutes of our train ride, let us briefly review the family of Chrysomelians. There are no less than 18,000 species of these leaf-eating beetles known in the world; the vast majority are tropical; North America can claim only about 1-25th of this number and Ontario about 1-70th. But even Ontario's share, nearly 300 species, makes a long list, the mere detailing of which would take some pages, while anything like systematic treatment, with specific or even generic description would require a volume; it would, besides, be more than tedious—it would be deadly dull. Henshaw's check-list makes about as inspiring reading as the list inspired of Walt Whitman's poems, and for the same reason—it's a mere catalogue. There are purple patches, I grant you, and not a few in LeConte and Horn or in Blatchley as there are in Professor Wickham's papers on the Chrysomelidæ of Ontario and Quebec (contained in volumes 28 and 29 of the Canadian Entomologist, 1896-7). What are these purple patches of interest?—these oases in a desert of dry description? At first sight they seem of varying nature; sometimes a brilliant generalization or an ingenious analogy; at others a quaint observation of habits or a personal experience. But they all resolve themselves, at last, into the personality of the writer. It is the personal element that lends interest to a book or a paper on a technical subject; it is just

this that makes the old-fashioned Lexicon of Samuel Johnston or Noah Webster an enthralling romance beside a modern dry-as-dust scientific work-of-a-syndicate like the Standard Dictionary.

It would obviously be impossible to write an interesting account of 264 species of beetles or even of 96 genera, but for the convenience of systematic treatment, this enormous mass of individuals, countless as the sands of the sea, has been marshalled, like the children of Israel, into 12 tribes, and every one of these tribes has several representatives in Ontario. In our day's tramp we shall run across at least one representative of each tribe, from Reuben the first born to little Benjamin, our ruler; in plain terms, from Donacia, the reed beetle, cousin german to the more ancient Cerambycidae, to Chelymorpha and Coptocycla the little Tortoise. Of these twelve tribes, the most numerous in boreal America, as well as the most important, are the five numbered VI-X. These comprise more than 450 species out of a total (to the family) of less than 600 and more than 70 genera in a total of about 100; i.e., $\frac{3}{4}$ of the entire genera and species belong to five consecutive tribes out of the twelve. Of these five tribes, again, two are supreme, the 9th and 10th included by LeConte and Horn in the single tribe of Galerucini or Helmet-grub beetles, with a total of more than 200 species and over 40 genera; i.e., nearly half the family.

In the tropics, where vegetation is most luxuriant, these beetles play an important part in checking the too-lavish growth; but in the Temperate Zone, where civilized man has brought the earth under cultivation, these twelve tribes, the chosen people of my paper, are nothing better than one of the plagues of Egypt, a most distinctive pest, and man's best wits are taxed to prevent an annual loss of many million dollars.

The Chrysomelians represent a later development than the Cerambycidae or wood-borers, and their adaptation to succulent herbage and the deciduous foliage of flowering plants pari-passu, with changes in the vegetable kingdom from sporophytes and gymnosperms, presents in its way as wonderful an illustration of adaptive development as more specific examples like symbiosis which has isolated the Yucca and its moth from all creation, till each depends on the other for its very existence and on the other only.

The larvæ of the Chrysomelians are in general soft and helpless; feeding, as they do, in the open and gregariously, they are easily destroyed; but several factors contribute to their notable success in the struggle for existence: their immense numbers, the rapidity of their growth (which enables them to produce more than one brood in a season), and the ability of the mature insect, in most cases, to hibernate.

A few of them retain traces of an earlier condition in being stem-borers, or in tapping the roots of plants, as the Donacias; and it may be a sort of atavism that impels *Cryptocephalus* and *Glyptoscelis* to resort to the needles and bark of white pine.

Our train is now slowing down to let us off at Quay's Crossing, and for the rest of the day we'll have to put our best foot forward, for it is going to be Shank's mare with us. First we go a quarter of a mile east to Mose Robinson's mill-pond and Pine Grove School-house. Just after crossing the stream here we turn south down a grassy lane, flanked on the west by an old snake fence and on the east by a still more ancient stump-fence; the snake fence appears to spring from a bed of fern-oak and brittle bladder. The lane is filled with sweet-briar and the stump fence festooned with wild grape-vine; a fortnight ago the briar and the grape-vine were both in bloom and the lane was redolent with two of the most delicious scents on earth. A little way on, at the foot of a sandy slope, we cross a tiny brook of lovely, cool spring water, its surface mantled with water-cress. Here in the early season, as early as April, are nearly always to be found about the grass-blades, some specimens of the *Donacia*. This is our representative of Tribe I, a small tribe generically, consisting of two members only; the genus *Hæmonia* has only one species, but the *Donacia* (Reed-beetle, as the Greek name implies) has more than 20 species in North America. The kind I have found here is much like a *Longicorn*, and in early days was mistaken by me for a member of that family; it differs from the Chrysomelians in being long and narrow in shape, usually yellowish brown in colour and of a metallic lustre. The larva feeds about the roots and bases of aquatic plants and has acquired the power of living under water by tapping the air-vessels of its food-plant. It has actually a small process on the body which it uses as a probe. When about to pupate, it encloses

itself in an air-tight cocoon which is fastened to the roots or stems of the food-plant beneath the surface. The beetle is covered on the under side with a pubescence that acts as a perfect aquifuge shedding the water like oilskin. The species found here in the cool days of April is more or less cylindrical (convex on the upper side) and quite sluggish in habit, but the *Donacia* of the dog-days in the height of summer is a very different creature. I well remember during my first visit to the Algonquin Park how one day I went over with the late Dr. Brodie to the little land-locked Cranberry Lake in the heart of the hardwood forests. It was a glaring hot day, with the sun at its height and perfectly calm. We rowed a boat down to the Cranberry marsh at the foot of the lake, where all sorts of botanical treasures awaited us. On the way we passed through a patch of water-lilies and flushed a covey of *Donacias*; there must have been hundreds, leaping and flying from the lily-pads, striking the sides of the boat, sometimes in the water, occasionally on our clothes, darting and glittering in the sun like sparks from the molten surface of the cauldron of heat formed by this woodland lake at high noon beneath an August sun. The activity of movement and extraordinary vitality in the sun's heat are not common among the Chrysomelians, but they are among some of the Longicorns, with which the *Donacias* have a close affinity. Lords, for the nonce, of all three elements, earth, air and water, they moved easily about all three, perfectly at home and at their ease. On cooler days, or when the breeze blows, they love to sit on their beloved lily-pads, like miniature batrachians, their thorax and head partly raised and their antennæ thrust forward alertly, something like the asparagus beetle when it scents danger.

We shall now stroll south about a mile, along the edge of a wood we call the North Wood, a wood sacred by many memories, rich in flowers, the home of some rare orchids, in and about which I have found more than 20 species of ferns and a wide range of warblers and other birds at the spring migration; it is, besides, the scene of many of my best captures among the Coleoptera. Ten minutes' walk brings us to where the wood narrows close to a division fence, running west across meadow-lands to the railway. Just here stands, on the edge of the wood, a hawthorn, whose blossom, for some reason or other, has proved a beetle-trap or bait

for an extraordinary number of species. It was on this blossom that I first captured specimens of the *Orsodacna*, our representative of Tribe II, and on the top-rail of the snake-fence, beside it I took one of the few specimens I have ever seen of *Syneta*, another of the four genera contained in this tribe. The *Orsodacna* (or Bud-gnawer) is said by Blatchley to feed on willow-blossoms, and this season, as early as April, I was on the look-out for it about clumps of willows in bloom, but the only thing new to me that I observed was a small moth dancing up and down in lively zigzag flight over the willow bushes; it was almost as small as a clothes moth, blackish with a cream or white bar near the apex of the wing. From its extremely long hair-like antennæ I should judge it a species of *Adela*. We have but one species of *Orsodacna*, and I have always found it in great numbers, once here and once in Lakefield. The specific name is *atra* (black), but it is very variable, and specimens sent by me to Guelph, taken a'll at the same time off this hawthorn bush some years ago, were returned labelled under no less than four varietal forms. The pigmentation of the elytra, normally black, becomes less heavy and the wing-covers show light brown with darker disks and markings. In some of its forms the blend of colours is very pretty; the beetle is narrow-oblong and the texture of its upper surface is of an oily smoothness.

Let us cross the meadow west to the railway track; near the fence that extends from the hawthorn tree to the railway, on the south side are some sand-drifts where I have captured no less than six species of Tiger-beetle at various times in the season. The meadow to the north is less sandy and springs ooze out from its surface and meander over the grassy slopes. Here in September the meadow is white and fragrant with *Spiranthes cernua*, the nodding Ladies' Tresses, one of our autumn orchids. Just where we strike the railway is an immense patch of that rather rare plant, the Grass of Parnassus, whose green-veined creamy white blossoms in August and September make as brave a show as the anemone in June and July. It is a sure sign of springs in the soil and further south there are traces of an old sphagnum moss swamp; though it is years since the railway hacked away the trees and shrubs, marsh pyrola and the Showy Ladies' Slipper annually rear their upright

stalks and unfold their blossoms for gauze-winged visitors to gather nectar from beneath the July sun.

Here, along the right of way, grows wild *Asparagus*, and on it you will find at least one species of the *Asparagus* beetle, which we shall take to stand for Tribe III. The first specimens I ever saw of this beetle were in a Kentish garden; they belonged to the species commonly known as the striped asparagus beetle, and at first I did not recognize the insect—all I had by way of guide was an old book of Stevens with coloured illustrations that were several times magnified. The picture showed a gorgeous insect, in rich dark green and cream hues, which to my excited imagination must be nearly as large as a June Bug. I found, however, to do the old naturalist justice, that though in the dead insect the sutural stripe, the basal marks and the cross-bar on the elytra appear black on a ground colour of opaque straw-yellow—in life these colours are a rich, vivid, dark green, on a ground colour of translucent cream, extremely beautiful when scanned with a lens. The 12-spotted species, which seems the commoner in Ontario and is apparently more hardy, I first found in the late Dr. Brodie's back garden in Toronto. Until five or six years ago neither species had made its way to Port Hope, but the spotted one appeared in several gardens then, followed a season or two later by the striped, and two seasons ago I first found the *Crioceris duodecimpunctata* on wild asparagus. There is only one other genus in this tribe—the *Lema*, of which there are no less than 16 species in North America, only a few occur in Ontario, and I have only found one—*Lema trilineata*, a beetle which sometimes shares with one of the Blister beetles the title of "the old-fashioned Potato Beetle"; it feeds on various plants of the Potato family, and I have found it in some abundance on the *Physalus* or Ground Cherry, while searching vainly for specimens of *Coptocycla clavata*, the Rough Tortoise Beetle. Before we leave the asparagus and return to our little brook a mile north, I may mention that it was on some garden *Asparagus* at Lakefield that I found my reward for a day's umpiring at a cricket match, in the shape of a beetle called *Anomoea laticlavata*. This is the only species in the IVth Tribe known to me; for though North America has seven genera in the tribe and over 20 species, there are but four genera represented in Canada, each by a single species.

It is, for a Chrysomelian, a decidedly large insect, stout and of striking appearance, light-brown in colour, with a black sutural stripe, which is slightly thickened from about midway down the elytra to near the apex. I have never since seen it on asparagus, but more than once I have taken it feeding in large numbers on willow-shrubs about the right of way, a few miles north of our present halting-place on the Peterborough railway. Last year I discovered it very abundant, almost a pest, on wild grape-vines near Sackville's Swamp, on the South Shore of Rice Lake, between Bewdley and Gore's Landing.

We now return to the little brook where our first *Donacias* were captured. Just over the fence, on our right hand, is a small pine wood, out of which, indeed, it is that our little brook emerges. This wood is a great place for early morels; it has also yielded some very interesting species of Longicorn and Clerid on the occasional windfall of white pine. Towards the north-east side of it, where our way lies, grows a patch of raspberry canes, where I captured once in full flight, with my hand, that most elusive of dodgers, the *Oberea*. On the leaves of the raspberry once I saw some tiny dark conical galls, as I supposed, and one of these I tried to tear from the leaf; to my surprise, when I had partly wrenched it aside, it distinctly moved and glued itself back on the leaf. This was something new for a gall, and I pulled it away from its fastenings to find that it contained a live larva, whose legs were kicking frantically to get back to the leaf. You have often seen a refractory man-child plucked suddenly up by the nurse from the place where it was playing? Well, that's how this caterpillar kicked. It was *Chlamys*, one of two genera that represent the Vth tribe. These insects construct a case out of their own excretions, and under cover of this tiny, steeple-crowned brownie's cap of a case they move about and feed securely; when the time comes to pupate, they simply close the door at which they have grazed and behold a ready-made cocoon. The insect itself is dark brownish black, and covered with little warty excrescences; when alarmed it closes its legs and falls to the ground, where it escapes notice entirely or is passed over by warblers and other insectivorous birds as a pebble or a pellet of dirt; one more instance of protective mimicry preserved in this creature through all stages of its existence.

(TO BE CONTINUED.)