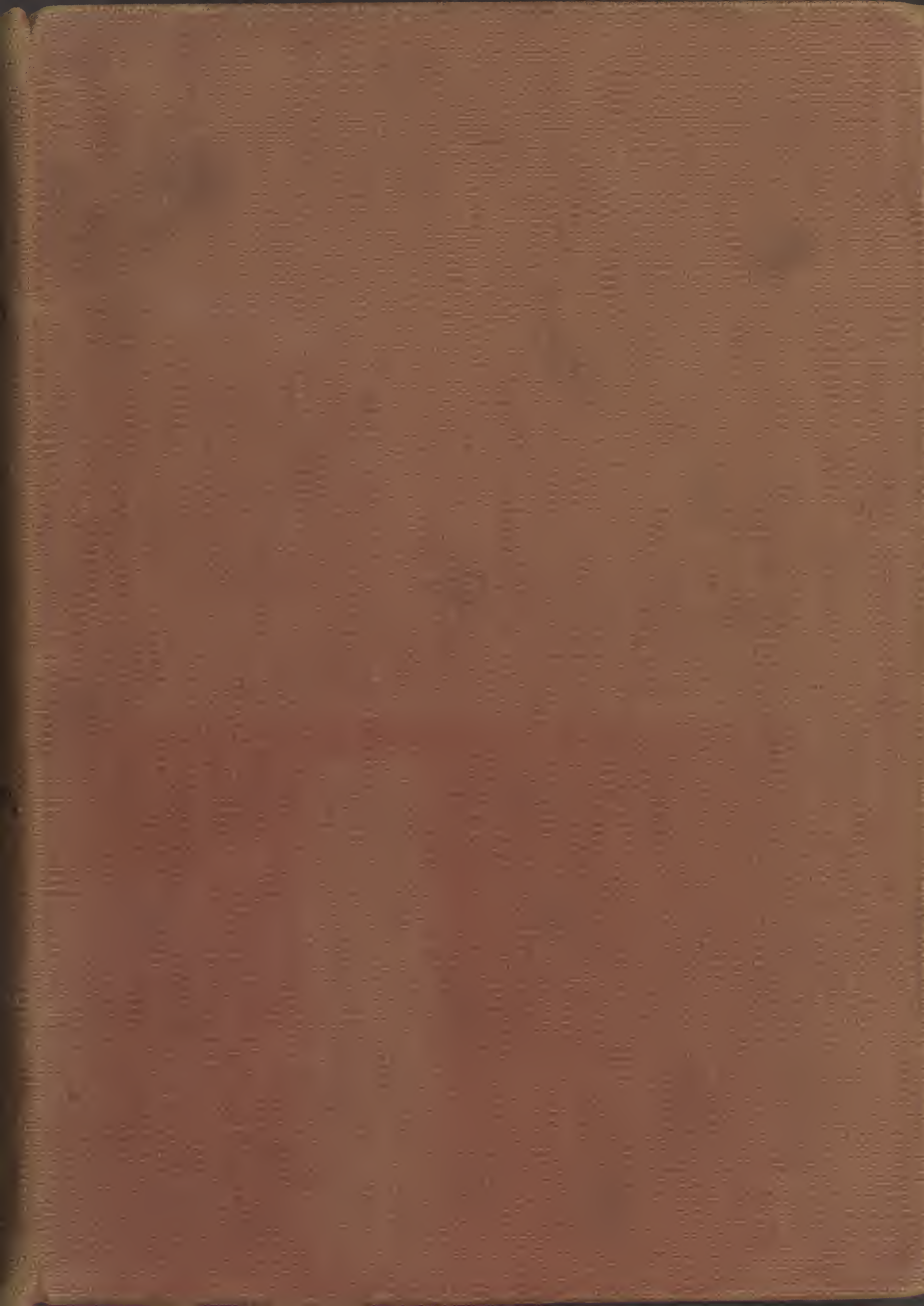


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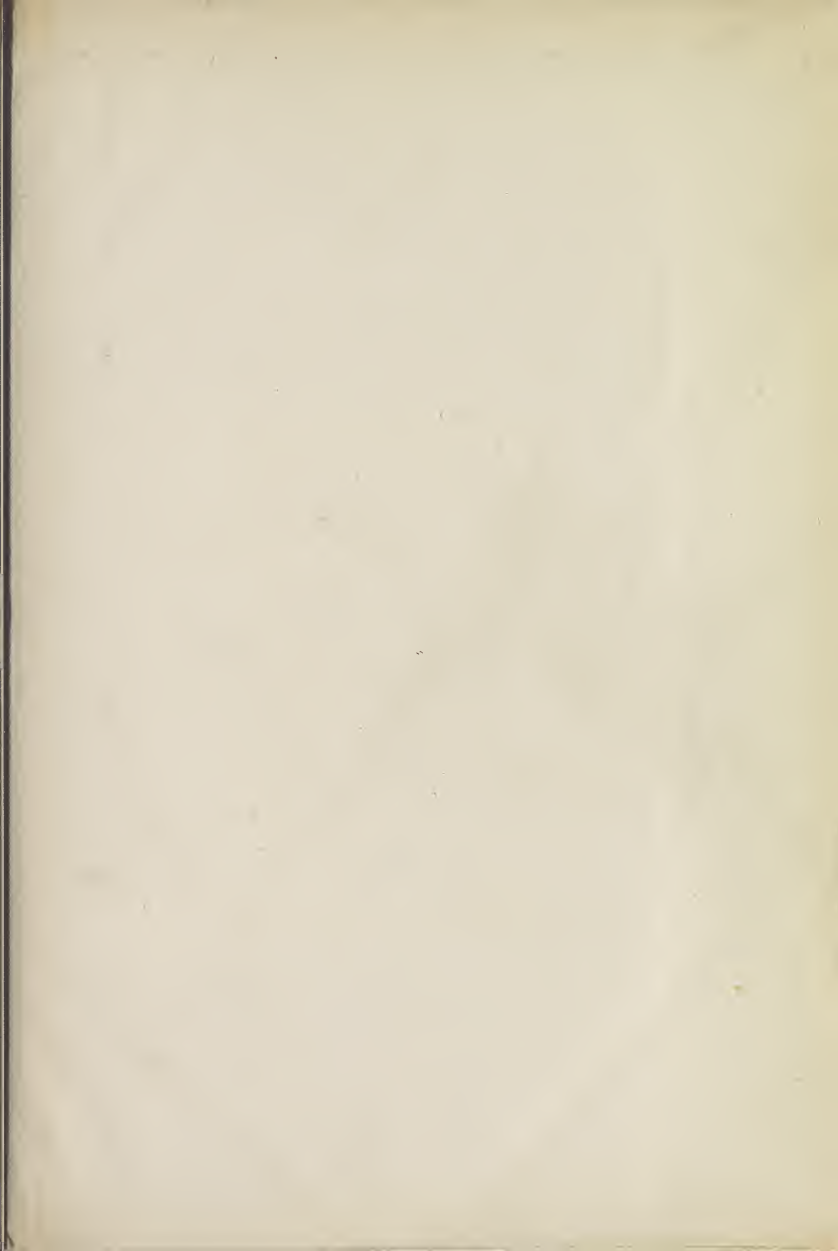


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MOTHS AND BUTTERFLIES
OF THE UNITED STATES

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MOTHS AND BUTTERFLIES OF THE UNITED STATES
East of the Rocky Mountains

By S. F. DENTON

A Limited Edition of 500 Copies, of which this is

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WILLIAM RAYNES M. D.
DECATUR, ILL.



UPPER SIDE

ATTACUS CYNTHIA

As Nature Shows Them

MOTHS AND BUTTERFLIES

OF THE

UNITED STATES

EAST OF THE ROCKY MOUNTAINS

With over 400 Photographic Illustrations in the Text and Many Transfers of
Species from Life

BY SHERMAN F. DENTON

Part I. THE MOTHS

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1900

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PREFACE.

SCIENTIFIC works on butterflies are not rare in most libraries; but to the enthusiast who loves these creatures for their beauty and variety there is usually very little of interest in scientific details.

It is the aim of the present work to represent our native butterflies and moths not as dried and mutilated specimens in a cabinet, with pins stuck through them, nor as dissected fragments for scientific classification, but as one sees them in our woods and fields, fresh and lovely.

From the standpoint of the artist and the decorator, the study of the designs and color patterns on the wings of butterflies may be of valuable assistance. Such combinations of pleasing tints are rarely found in the handiworks of man. What better school could be found for the colorist than is within the reach of the humblest aspirant for fame as artist or decorator? Think of students copying the dingy works of the old-masters year after year, when at their own doors the grandest combinations of colors that Nature can produce are passed by without a thought! We have close about us the best that Nature is capable of producing, if we but use our eyes to see it.

The life histories of many of the lepidoptera are replete with interest, and the knowledge of not a few is essential to man's welfare. To the gardener or the florist the study of entomology is a necessity, and the recognition of his enemies and friends in the insect world is of first importance.

To those who have, or desire to have, a cabinet of specimens, this study will be found of never-failing interest, as one may pursue his researches through all seasons of the year. Improved methods of mounting and keeping such specimens render their preservation and care a simple matter; and the collections made in one's childhood may be kept to delight one's old age. The practical hints on collecting and rearing specimens, the result of many years' experience, will be appreciated by beginners and the new methods of illustration herein used will greatly help the student in identifying and naming his specimens.

The colored plates, or Nature Prints, used in the work, are direct transfers from the insects themselves; that is to say, the scales of the wings of the insects are transferred to the paper while the bodies are printed from engravings and afterward colored by hand. The making of such transfers is not original with me, but it took a good deal of experimenting to so perfect the process as to make the transfers, on account of their fidelity to detail and their durability, fit for use as illustrations in such a work. And what magnificent illustrations they are, embodying all the beauty and perfection of the specimens themselves!

As I have had to make over fifty thousand of these transfers for the entire edition, not being able to get any one to help me who would do the work as I desired it done, and as more than half the specimens from which they were made were collected by myself, I having made many trips to different parts of the country for their capture, some idea of the labor in connection with preparing the material for the publication may be obtained.

I will say, however, that there never was laborer more in love with his work, or one whose labors took him among pleasanter scenes. In collecting such a large number of specimens, many new facts in regard to the habits of these charming creatures have been observed, and to write interestingly of their lives and to give a few examples of their marvellous beauty has been the aim of the author.

SHERMAN F. DENTON.

WELLESLEY, MASS., 1899.

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HETEROCERA

THE MOTHS

Lepidoptera; or Scale-winged Insects.

THE LIFE HISTORY.



THE name *Lepidoptera* was first applied by the naturalist Linnæus to the order of insects known as butterflies and moths.

The dust which covers the wings and bodies of these insects, when placed under a microscope of low power, is seen to be composed of minute scales. These vary in form from those elongated into hairs

to flat wide plates not unlike in appearance the scales of fishes.

The variety in shape and color of the scales of different species of *Lepidoptera* is amazing, and a number sprinkled on a microscopic slide will frequently display all the glitter and iridescence of a casket of precious jewels. To these scales the beauty of coloring of this order of insects is entirely due; for when they are removed, the



Butterfly Scales.

wings are seen to be composed of veins or ribs, with thin transparent membranes extending between them. Many of the scales are striated or corrugated and decompose the light in such a way as to give to our eyes those combinations of colors so pleasing to behold. They are

frequently arranged on the wings in regular order, as are the scales on reptiles or fishes, and when removed leave a slight scar on the membrane where they were attached.

In studying the structure of a butterfly, turn it underside uppermost. It will then be seen to be composed of three distinct parts: the head, which supports the antennæ (popularly known as feelers), the eyes, and the mouth parts; the thorax, to which are attached two pairs of wings and three pairs of legs; and the abdomen.

The eyes of butterflies and moths are compound, and the facets vary in different species from several hundred to many thousand. The vision of some of the higher butterflies is exceedingly acute, as one will often have reason to note when cautiously endeavoring to approach some coveted prize near enough to use the net. Many moths, on the contrary, seem to be simply able to distinguish between light and darkness, and are apparently more often guided by the sense of smell than of sight.

The antennæ have been supposed by some naturalists to be organs of smell, and there is certainly good foundation for this supposition. They vary in shape from hair-like and feather-like in many of the moths to rods with club-shaped ends in most of the butterflies.



Antennæ.

By the antennæ the beginner may most easily distinguish between butterflies and moths. The antennæ of butterflies are nearly always blunt or knobbed at the ends, while the same organs in moths are generally pointed.

The mouth parts of the lepidoptera are constructed for sucking the sweets from flowers or the juices from other substances; and while some of the moths have no way of taking nourishment in their perfect state, most of the species of this order are provided with a

long tongue which, when not in use, is coiled into a close spiral between the palpi. This reaches its greatest development in some



Tongue of Sphinx.

of the sphinx moths, enabling them while on the wing to extract the nectar from the deepest flowers.

While most of the lepidoptera have six well-developed legs, a group of butterflies, the *Nymphalidæ*, have the first pair so small and weak that they are probably of very little use to the insect. The legs are used almost wholly for clinging to substances while the insects are at rest, as very few of the lepidoptera walk or run to any extent.

The butterflies are day flyers, and in the hot sunny hours they sport through the woods and fields. The moths fly mostly by night, and are frequently more hairy and larger bodied than the butterflies, while their colors are usually softer and more blended.

The life history of one of the insects we are considering, from the egg to the fly, is most interesting. The perfect insect lays its eggs, by a wonderful faculty, which for want of a better word we call instinct, upon or near the species of plants which are to furnish the food for the future caterpillars.

These eggs, often very minute, are of various shapes and are ornamented in a variety of ways. Some are oblong; others almost perfect spheres; others again flattened above and below, while their outlines are circular. With these shapes go smooth and sometimes highly polished surfaces. Some resemble low vases with turned-over and fluted edges, while they are adorned with raised patterns or sharply cut grooves or circular pits, or in other examples studded with nodules or even with spines. Others bear a general resemblance to a lady's work-basket in shape and reticulated ornamentation. Some have a lid or cover, which is raised by the caterpillar when about to emerge from the shell. They vary too, in color as well as in shape and ornamentation; some are white or of a pearly lustre, some blue or gray, while a large number are green, and a few brown

or black. An interesting collection may be made of these eggs alone, and an entomologist can often tell from examining an egg the species of butterfly to which it belongs.

When the larva emerges, so small and so unlike the mature insect, no one would guess what it was to be. It crawls to the tips of the tender young leaves and makes its first meal. It soon begins to grow rapidly; and as it grows its skin becomes too small for its constantly increasing bulk, and a new skin begins to form under the old one, which after a short period of rest the caterpillar casts off. This is done in the following manner: the insect first spins upon the leaf or twig upon which it rests a mat of silk to which it can hold firmly with its claws and claspers. It ceases to eat for a period and remains perfectly quiet upon the mat. It becomes so dull and sickly in appearance that one might suppose it was about to die. At length it begins to twist its head from side to side vigorously, and after a series of contortions in which the forward segments swell and shrink alternately, the skin splits down the middle of the back and the rent is further enlarged by the struggles of the insect until it can draw its head and legs out of the opening, when by securing a firm hold with its forward hooks it crawls out of its old skin looking as bright as a gold coin fresh from the mint. It is feeble and exhausted from its labors, while its skin and even its head and legs are soft and tender, and it now remains quiet until the skin dries and toughens by exposure, when it is ready once more to attack with renewed energy the tender leaves of its food plant.

The cast-off skin sometimes retains the shape and colors of the caterpillar to a surprising degree — a veritable ghost of the former insect. Some caterpillars devour their outgrown garments as a first meal after each moult; others leave them where they were cast; and one species carries in front of its head on a tuft of hairs, during its caterpillar life, the cast-off shells of its head which were shed with each change of skin, thus keeping in sight a record of its outgrown coverings from infancy. When the caterpillars are gregarious these cast-off skins in groups representing each moult of the colony may frequently be seen on one plant. The moulting period is a critical time in the life of the larva, for it is not only helpless to resist the attacks of enemies but it may die from exhaustion in the act of shedding its skin.

The larva eats ravenously (sometimes devouring twice its weight of food in twenty-four hours) after it resumes activity, with a



Development of a Butterfly.

corresponding rapid growth in size. In consequence its new coat soon becomes too small, and the moulting process is repeated several (sometimes five or six) times, with corresponding changes in the size of the larva. In many instances there are marked changes in the colors and the shape of the caterpillar after each moult. At length, in the course of several weeks, the insect arrives at its full growth. It now ceases to eat, and looks about for a suitable place in which to pass its period of inactivity, known as the pupa or chrysalis state. And here, before he spins his cocoon or changes to a pupa, we will take a last good look at him.

The larva of a lepidopterous insect is jointed or segmented into thirteen divisions. First comes the head, which is usually hard and horny; the eyes, twelve in number, are very small, and are placed near the mouth. They are simple eyes with very convex lenses, so that the range of vision must be very short; in fact, so deficient is the sight of caterpillars one may conclude that they are guided more by the sense of feeling than by sight. Place a caterpillar on a twig and watch it ascend, feeling its way and reaching out from side to side before every advance movement. When it reaches the top, it does not survey the scene below, but taking a firm hold with its last two or three pairs of claspers, it stretchês its body out to the utmost, swinging first one side and then the other, in order to feel if there is anything beyond on which it can lay hold.

The jaws of a caterpillar move horizontally and are powerful instruments, capable in the larger species of biting through the tough ribs of leaves as the insect reaches them while feeding. Crawling down the midrib of a leaf the caterpillar advances toward the edge, and holding the leaf between one or more pairs of its horny front legs, it brings its jaws together on opposite sides, cutting out a small piece with each bite, and continuing this down with regular order, it soon cuts out a largé semicircular space, taking ribs and all. A smaller caterpillar will simply eat away the soft parts of the leaf between the small ribs, leaving a skeleton; while the very minute leaf miners burrow in the substance of the leaf between the upper and lower skin.

The noise made by a large colony of larvæ while feeding has been compared to that made by a heavy shower of rain on an attic roof; and the quantity of food which they require is well-nigh appalling to a novice who has started perhaps with several hundred tiny creatures which could all make a meal on a handful of leaves, and

finds that they need bushels of fresh food daily when nearly full grown. Of course, in a state of nature the large larvæ are usually widely scattered, so that their ravages are not so noticeable; but when feeding a large number hatched from eggs one is liable to find he has an elephant on his hands.

A little protuberance under the mouth of the larva is the silk-spinning organ. This is the external opening to the silk secreting glands, which consist of two tubes or sacks, one on either side of the body, containing the viscid fluid which, by exposure to the air, dries and hardens into silk. This silk is used in a variety of ways by the different species of caterpillars. Some colonies build nests for their mutual protection; others attach a thin thread to the leaves and branches of the plants as they crawl over them, so that they are with difficulty shaken off, for they merely let themselves down on their threads a short distance and then crawl up again when the danger is past. Many species spin cocoons as silky coverings for themselves when they are about to pupate; and a good many of the butterfly larvæ not only attach the posterior extremity of the abdomen to a silken carpet but anchor themselves with a strong cable spun about the body and attached to the substance from which they are suspended.

If we examine a caterpillar, we shall notice that the first three pairs of legs, attached to the second, third and fourth segments



Caterpillar of Butterfly.

(calling the head the first), are different from the fleshy legs or claspers. These first six legs are hard and horny and provided with claws or hooks at the ends. They are the true legs and correspond to the legs of the perfect fly. The usual number of claspers is five pairs, and these are placed on the seventh, eighth, ninth, tenth and

thirteenth segments—the fifth, sixth, eleventh and twelfth segments having none. A number of caterpillars, however, have but four pairs of claspers (also called abdominal legs or prolegs), while a few have but two pairs, and these situated at the extremity of the body. The claspers are thick and fleshy, and may be extended or contracted, while their ends are surrounded with a number of minute hooks. These prolegs or claspers are absorbed into the abdomen of the insect during its transformation into a pupa.

In walking, a caterpillar advances by an undulating motion, extending and contracting its body. A few species (the geometrids) advance by bending the body up into a loop and then extending it to its full length. These are sometimes called inch-worms or measure-worms, from their mode of progression.

Insects breathe through spiracles or air-tubes in their sides; and the openings of these tubes are often plainly visible in caterpillars, especially in smooth ones. They are located on the segments, one on either side, and are often enclosed in a small circular or oval patch of color.

The variety of the shapes and colors of caterpillars is well-nigh endless, and often most wonderful, they being adapted in many instances to so resemble the plants upon which they feed that their enemies are baffled in their search for them.

Some look and act as if they were venomous, while others are by their repulsive or even terrible appearance calculated to frighten insect-devouring creatures. Some are smooth-skinned, some humped, or covered with bunches, tubercles, warts, fleshy filaments, horns, spikes, spines, bristles, hairs or down, and sometimes a combination of several of these. A few sting like the nettle, while others shed their sharp pointed hairs which work into the flesh if they are roughly handled. Some secrete strong, disagreeable odors, while some are perfumed like a dandy at a ball. Their colors are scarcely less wonderful. Some bear large spots which look like great eyes watching from the leaves. Some are striped or banded, or sprinkled with dots. They are of every imaginable color or shade, but the majority are green, and so nearly resemble the leaves among which they feed that it is difficult to see them. Some look as if made of bark and covered with lichens; others so closely resemble twigs with their minute knots as to deceive even the expert.

But with all these subterfuges for protection, the birds, toads and ichneumon flies find most of them out; thus, in spite of the countless

millions which hatch from the eggs each season, their numbers are mostly kept within bounds.

But to resume our history of the life of the caterpillar. As before mentioned, some species make for themselves cocoons; others burrow down into the soil or hide among the fallen leaves at the roots of trees; while still others have no covering, and suspend themselves by silken webs in various localities. In preparing for the pupa state a change takes place in the appearance of the caterpillar. Its colors fade; it shortens and thickens; and at length, after move-



Development of the Moth.

ments similar to those which it uses in changing its skin in moulting, a seam opens in the back, and the larval skin is worked backwards and finally off.

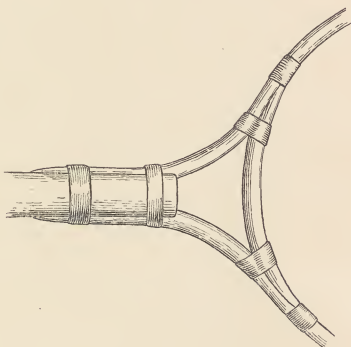
It is now a pupa or chrysalis, looking neither like the caterpillar which it was nor the fly which it is to be. By close examination the legs, wings, antennæ, etc., may be clearly made out; but how compactly they are placed together! Not a particle of room is wasted. It seems most marvellous that from this inactive, fossil-like creature,

a butterfly full of life and beauty shall emerge. Beneath this hard and usually dull-colored exterior, what wonderful changes are taking place! Simple eyes give place to compound eyes; biting jaws change to a sucking tube, with its palpi; antennæ spring from its head, wings from the sides of its body, and a delicate scale armor covers the whole. What tale from "The Arabian Nights" can equal marvels in the life history of a common butterfly? At length after weeks, in some cases months, of inactivity, through the shell of the chrysalis may be dimly seen the colors of the developing insect. A slight split opens in the back of the shelly case, and as this widens and opens the butterfly slowly crawls out, and, after finding a suitable place, hangs almost motionless. The creature is still very unlike the butterfly with which we are so familiar. Its body is soft and weak; its wings are no larger than one's finger-nail, and it looks wet and bedraggled. But watch it. Its wings begin to swell with the fluid which is pumped into them from its body. It appears to grow as we look, and in half an hour it is a glorious creature, a living jewel. Oh, how perfect and beautiful it is—not a mar on its velvety wings! We rarely see one in a wild state so fresh and flawless. It is now at its best. It has reached this grand climax after weeks of preparation, and we can but admire its wondrous beauty. With the emerging and developing of the perfect insect, its growth ceases, for a little butterfly never grows to be a big one. A part injured, a wing torn, is never mended; loosened scales are never replaced; and its life from now on sees it less bright and beautiful day after day. After depositing its eggs for the next generation it soon becomes a tattered, helpless creature, and falls an easy prey to one of its many enemies.

IMPLEMENTS FOR COLLECTING.

THE NET.

First of all and most important of all is the net. The lightest, most serviceable, and in every way the best net that I know of is made with a rim of rattan. Procure a light piece of straight-grained pine, two feet long and one inch thick. Plane it down for a net handle a little smaller at one end, and make a groove with a gouge, on either side of the smaller end, four inches long. Now, take a

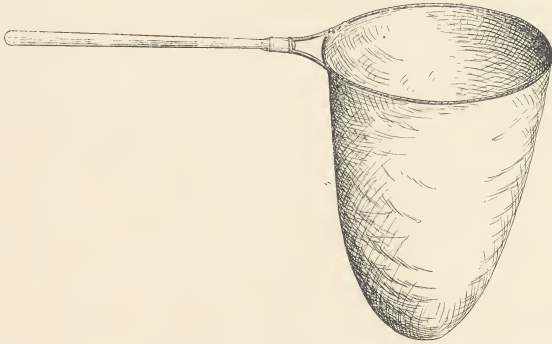


Detail of Net Rim.

piece of rattan sixty-six inches long, rather thicker than a lead-pencil, and fasten the ends to the handle with two bands of copper wire. This will make a net about eighteen inches in diameter. By now taking a short piece of rattan, twenty inches long, making a long level at both ends, grooving them out a little and wiring it to the rattan hoop, as shown in the following figure, you have a splendid rim for a net, and one that will last for years. In order to be sure

that the hoop will be symmetrical after it is completed, it is a good plan to first fasten the small piece of rattan on with twine, and when it is satisfactory in shape, wire the whole together in a substantial manner. The rattan will bend better if soaked in hot water for an hour. A coat of paint or shellac over the handle and the bands of wire is likely to make the whole more durable.

To make the net, about two yards of mosquito netting, one yard wide, are necessary. Sew the netting on the rim with strong thread (carpet thread will answer), button-hole stitch, selvage next the rim, and when round, cut off the surplus and let the net hang down. The net should be made rounded, not pointed, at the



The Net Completed.

bottom; and, in order to accomplish this nicely, pin the sides of the netting together at intervals of two or three inches, cut off the corners with scissors, and sew together with an over and over stitch. The finished net should look like the annexed figure. The netting used should be soft and fine and of some inconspicuous color, such as brown or green. New netting generally contains some starch which renders it stiff, but soaking in hot water for a few minutes after the net is made will obviate this difficulty.

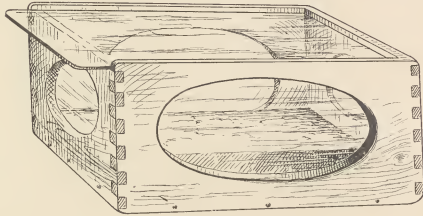
The netting will have to be renewed once or twice in a season if much collecting is done. If rattan is not easily procurable, one may

use stout iron wire such as telegraph wire, but it makes the net heavier and less flexible. A straight piece of willow, as large as one's little finger, will answer for a rim when nothing else can be obtained. Some may find that a net smaller in diameter and with a longer handle will answer their purpose better; but it is difficult to manipulate a net with one hand if the handle is longer, and the larger the net one can swing the more likely he is to capture the large and rapid flying insects which may come his way.

Where insects fly very high, as they sometimes do, a net will have to be fastened to the end of a pole. A jointed bamboo fish-pole is a very good thing to use in this case, as the short handle of the net may be fitted into the brass ferule of the rod at the second joint. But it will rarely be necessary to use a net of this description as most of our native butterflies may be easily taken with a short-handled net.

COLLECTING BOX OR JAR.

A thin glass tumbler, with a tight-fitting cork stopper, will answer for killing small specimens and an occasional large one; but it is almost too small for one who intends to do a large amount of collecting. The tumbler is prepared as follows: Put into it one



Poison Box.

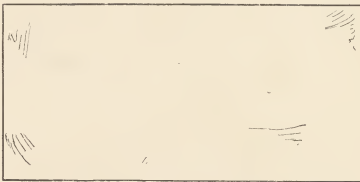
ounce of cyanide of potassium broken into fragments and cover with an inch of sawdust well pressed down. Mix a small quantity of plaster-of-Paris and water to the consistency of rich cream and pour over the sawdust to the depth of half an inch. When the plaster hardens the "bottle" is ready for use, killing in a few moments,

without injury, all insects placed in it. Great care should be used in handling the cyanide. Do not breathe the fumes of it as they are deadly poison.

A more convenient and more useful article for killing insects can be made in the following manner: Purchase at the drug store a small box with a sliding cover and dovetailed corners, six inches long, four inches wide and three inches deep. It may be difficult to get a box as shallow as this, but if the other dimensions are right, it may be cut down to the right height. This box should be taken to a glazier, and have him fit into it one piece of glass for a sliding cover and five pieces for bottom and sides. These latter pieces should be fastened on with shellac, and thin glass should be used to make the box as light as possible. When the shellac is dry, put in the cyanide as with the tumbler. This box will hold a large number of insects with papers between them, and will be found very useful when one is doing much collecting. Occasionally the cyanide becomes so dry in the collecting box or bottle that it fails to kill the insects quickly. The addition of a few drops of water will generally restore it to full strength.

A small leather satchel suspended by a strap from the shoulder is a first-class addition to the collector's outfit. Into it may be put the captured insects in their envelopes or collecting papers, with needles and thread for mending the net or the clothing, insect forceps, etc. A small light box with straps attached may be used in place of the satchel.

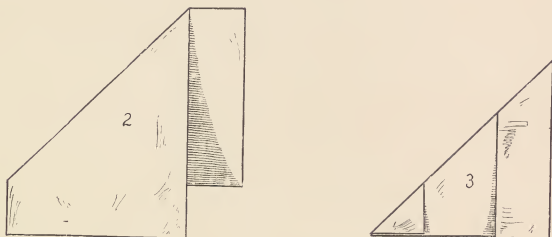
Collecting papers or envelopes are made thus: Take smooth,



Shape for Collecting Papers.

strong paper (newspapers will answer, if nothing better can be procured) and cut out an oblong piece as shown in the cut. Fold the

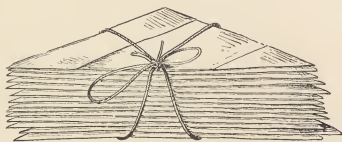
ends across at right angles to each other; after which fold one of the ends over again, put the insect in head downward, being care-



The Folding of Collecting Papers.

ful that its wings be flat; fold the other end over, and the envelope is finished. Some collectors fasten one end of the paper down with a little gum or paste; but the dried insect is not so easily taken out of such a paper. One collector whom I know uses coupon envelopes for his butterflies. They are very cheap and convenient to handle, being all one size.

Insects in their papers should be left exposed to the air for a couple of days to partly dry; then they may be tied up in bundles,

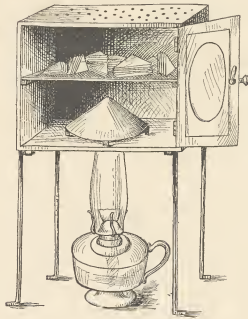


Bundle of Insects in their Envelopes.

and are ready to store away in boxes or to be sent by mail or express to their destination.

TO DRY INSECTS.

In very wet weather insects may have to be dried artificially, to insure them against mildew. A good article for this purpose is a light tin or sheet-iron oven with detachable legs so made as to be set



Oven for Drying Insects.

over a lamp. In this the insects are placed in their papers. This is very useful in tropical countries where specimens may be taken at the rate of several hundred a day; but ordinarily one can use the kitchen oven for drying his specimens in wet weather. Lay them loosely on the oven shelf, with the door slightly open and they will dry nicely in an hour or two. Some very large-bodied insects take a good while to dry; and if a slit is made in the under side of the abdomen with a sharp knife, the contents taken out and the space carefully filled with cotton gently crowded in, the body will look better when dry.

The bodies of many of the large moths, especially the males of the silk-spinning species, are filled with a natural oil which is liable to gradually ooze out and spread over the entire insect, ruining its appearance and perhaps causing the poor collector many a sigh over his lost treasure. This may be remedied by cleaning out the abdomen of all such insects and stuffing with cotton. Another method

which I have used with success is to snip off the abdomen of such an insect, cut it open on the under side, remove the contents and soak it in gasolene for twenty-four hours, after which it can be stuffed and replaced in its former position with shellac. This process, of course, does away with all liability of the insect becoming greasy.

To restore the beauty of greasy specimens, place them in gasolene in a shallow, covered pan, for twenty-four hours or longer, when they will come out bright and clean. Downy or hairy specimens may need a little blowing to restore their fluffy appearance.

The fumes of bisulphide of carbon will kill insect pests which may have found their way among unmounted specimens. Pour an ounce or two into a dish placed in the cabinet and close it up tight for forty-eight hours. Care should be exercised in its use, as it is very volatile and explosive.

PREPARATIONS FOR A CABINET.

There are several ways to prepare lepidopterous insects for the cabinet. I need mention but two: one by the ordinary method of spreading the wings and with a pin thrust through the thorax, well known and used by most collectors the world over since man began to collect and preserve the beautiful objects of nature; and the other by a new and improved method invented by the author in 1894.

After having accumulated a beautiful collection of butterflies and moths from different parts of the world, only to see it finally destroyed in spite of all the care I had bestowed upon it, and knowing my experience had been that of hundreds of other persons, the necessity of some means by which specimens might be kept safe from the many dangers which threaten them forced itself upon me. As the result of a good deal of thought and many experiments, I invented a simple, light, strong, glass-covered tablet which not only renders the destruction of the specimens impossible, but puts them in a shape at once more beautiful, and infinitely neater, than was possible by the antiquated method of impaling them on pins — a prey to insects and a refuge for dust — and liable to be broken even by a careless breath.

Some of the advantages of my invention over the old method of pinning insects are these:

They are protected against breakage, dust and museum pests, and specimens once so put up are good for hundreds of years.

A collection thus mounted needs no care whatever, neither is it necessary to have tight boxes or cabinets; and one may leave his collection indefinitely without the least danger.

There is no odor from the specimens, neither is it necessary to fumigate the cabinet at all, and the vile smells caused by the use of naphthaline and bisulphide of carbon are entirely done away with.

There are no pins to obstruct a view of the specimens, or to make them appear as if impaled alive.

There is no danger in showing the collection to *any* one, and the most valuable specimens may be handed around for a close inspection of their beauties without the least danger of breakage.

A collection of this kind occupies but half the space of a collection mounted on pins, as the drawers of the cabinet need be but one inch deep inside.

Lastly, the wings of specimens mounted in this way lie perfectly flat, as the glass rests directly on them, and they therefore cannot lop down or warp up, as pinned insects are liable to do.

Many will be surprised to see how lovely are some of our most common things mounted by this new method, making each specimen a picture.

The tablets are made of many sizes, to accommodate every variety of specimen. They are flat on the top, with a body cavity of the size and shape to fit the body of the insect; are white with a glass-like polish on the face; are hollow at the back, in order to be as light as possible, and this hollow is covered with card-board when the insects are mounted.

As my own method is in every way superior to the other, and is already being adopted by the museums not only of this country but of the world, I shall devote the most of this chapter to a detailed description of how best to put up a collection as it should be to remain indefinitely, and to show to the best advantage. I am aware that I shall encounter—in fact I have already encountered—the opposition of many of those collectors who have spent years in putting up their collections by the old methods. It is not reasonable to suppose that entomologists will welcome with open arms an invention which makes the collections of a lifetime look poor and out of date; but why, I ask, should not improvements be made in mounting butterflies as well as in making shoes or in printing newspapers?

This is an age of invention. Everything is being improved upon where the ingenuity of man can suggest improvement, and we are no longer satisfied with the moss-grown methods of our grandfathers. Go into almost any of our museums or natural history rooms, and look at the collections of butterflies. Did one ever see anywhere else such a miserable display? Wings torn and worn, bodies devoured by museum pests, and the whole so dusty that one can scarcely identify the species. Why, any able-bodied collector can make and put up in one season at very small expense a collection that will put to shame any of the exhibition collections in the museums of the country. Collections of insects can be made surpassingly beautiful and an ornament to the finest palace that man can build. It is no discredit to a museum to have the best. It is a mis-

take to suppose that a collection need be slovenly in order to be scientific. Science should be made attractive, and the beauty of which Nature is so lavish should not all be driven from our museums. Old curiosity shops for the storage of objects of natural history should give place to magnificent buildings devoted to the display of the rarest and most beautiful which Nature produces. I will make no further excuse, therefore, for introducing my invention to the reader's notice, for, outside of my personal interest in the matter, it is the only practical way known to me of mounting a collection of lepidopterous insects.

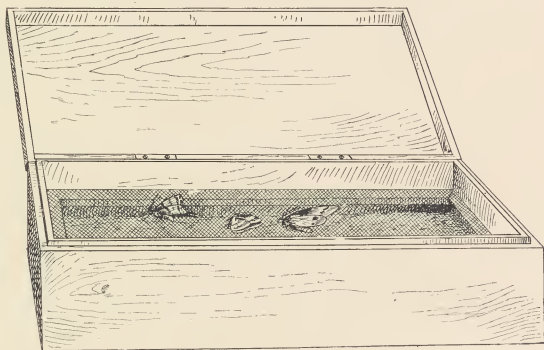
Let us suppose, then, that the collector has been out with the net and has brought in an assortment of butterflies for the beginning of a collection. These may be spread either when fresh, or, which is simpler, may be placed in collecting papers and allowed to dry, and when a number are procured, softened in the relaxing-box and then spread. This latter method is preferable in many ways, the most important being that the specimens having once been dried will dry again very quickly, twenty-four hours usually being sufficient to render them rigid, while if the insects are spread in a fresh state they may require from four days to two weeks to dry thoroughly.

THE RELAXING-BOX.

To make one, use a tight box, one foot square and five inches deep, with a hinged cover; paint it inside and out with three coats of house paint, and when thoroughly dry put into it two inches of wet sawdust pressed down flat. Make a light wooden frame to fit the inside of the box, stretch netting over it and secure it with two or three brads an inch above the sawdust. When this is all ready place the dried insects on the net, and in twenty-four hours they will be soft enough to spread without breaking. The success of this method depends on having a tight box. The net on the frame does not allow the insects to come in direct contact with the wet sawdust, but they absorb enough moisture to render them pliable and are not liable to become too wet. Silk veiling makes an excellent article to use on the frame in place of the net, as it is soft and fine. Water should be added to the sawdust whenever it becomes too dry. A small quantity of powdered alum put into the water will prevent the sawdust from becoming mouldy.

A much simpler way, although to my thinking not so safe to use with valuable specimens, is to have a plain wooden box filled with wet sawdust in which deep grooves are made and the butterflies placed body down in their papers in these grooves. One needs to be careful not to have the sawdust too wet in this case as the insects are liable to absorb too much water, which may injure their appearance.

After the insects have remained in the relaxing-box until pliable (the following method may also be used for fresh specimens), they should be spread underside uppermost on smooth pine blocks; these may be from four to six inches square and covered with smooth paper



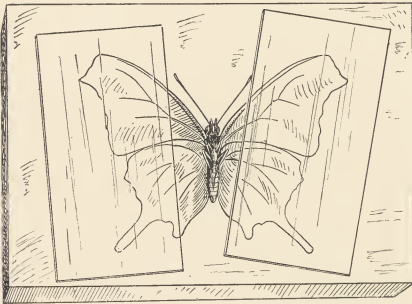
Relaxing-Box.

pasted to the face. Pin the insect to be spread through the thorax (stout insect pins will be found best for this purpose) on the block *wrong side up*; spread the wings with fine needles; lay strips of glass on them; secure the legs and antennæ in place with pins; and allow the specimen to dry, after which it will be found very flat and in the right condition for mounting. Insects may be kept in this state in a tight box until the collector is ready to mount them in the tablets.

A good many insects, especially butterflies, show a marked difference between the upper and under side of the wings. When it is desired to show the under side, the insect should be spread on the

block *right side up* and the glass strips placed on the wings not far from their tips so as not to bend the wings too much. In spreading a fresh insect the pin through the thorax must be removed at the time of spreading, otherwise it will become so firmly attached that the specimen may be broken in removing it. With an insect which has once been dried this precaution is not necessary as the pin may be removed at any time.

A smooth paper or palette knife will be found useful for opening the wings of the insects to be spread. Take the specimen in the left hand between the thumb and finger, and after inserting the knife between the wings bend them down on each side. If all the insects



Insect Spread on Setting Block.

in a collection are spread so that the lower margins of the upper wings are at right angles to an imaginary line drawn lengthwise through the centre of the body the whole will look uniform and the beauty of the individual insects will be shown to the best advantage. The setting needles may be made more convenient to use if the ends are pushed into small wooden handles, match stubs for instance. If the needles are too long, as is apt to be the case, break them in two and use the points only. For mending broken insects and replacing detached antennæ and legs, use white shellac. The appearance of a specimen whose wings are slightly injured may be very much

improved by fastening on the back with shellac a piece of another butterfly which matches it in color.

For handling insects, use smooth broad-tipped forceps. If these cannot be purchased at a store where naturalists' supplies are kept,



Forceps for Handling Insects.

a pair may be made by an expert out of hard rubber or tortoise-shell. I have known a pair of tin candy tongs to answer for forceps after the tips were made flat and smooth.

PREPARING LARVÆ AND PUPÆ.

Collections where larvæ and pupæ are added are enhanced two-fold in their value from the standpoint of the naturalist. The weird and varied forms with the remarkable coloring of some of the species makes them exceedingly interesting when taken in connection with the fully developed insect. When it is remembered that the active life of a butterfly is but a very few days at the most, and that by far the greater part of its existence is passed in the larval state, the state when it is directly injurious to man's interests, one can readily appreciate the importance of studying the insects at this stage. Larvæ are not easily prepared to look well in the cabinet, and to make them look at all natural requires painstaking labor.

One method, which has been used with considerable success, is to inflate and dry the skin of the larva after the contents have been squeezed out through the anal opening. This is done by first killing the larva in the poison jar, then laying it on soft paper or cloth and, beginning at the head, rolling it gently toward the posterior end, under a round lead-pencil wound with soft canton-flannel or blotting-paper. When the skin is quite empty, insert a straw into the opening and gently inflate the skin, at the same time turning it round over

a lighted lamp. A small spring of steel fastened to the end of the straw in such a way that it may prevent the slipping of the larva skin as it is inflated will prove useful, and a little sheet-iron oven to slip over the lamp, having small openings above and below, will prevent the burning of the specimens as they dry. Many larvæ, especially the hairy ones, will look well if carefully prepared in this way. A considerable number though look anything but like the natural caterpillar.

I have tried another method with success, which, requiring little more skill, is much more satisfactory in its results. Treat the caterpillar the same as if it were to be inflated with air, but instead, inject into it hot paraffine or beeswax, colored to resemble the contents of the natural insect. This is done as follows: Procure at the drug store a small collapsible rubber syringe (the ball and tubing connected with an atomizer for perfume will answer as well), and into the opening insert a piece of small brass tubing, having a small steel spring attached to hold the larva. Purchase a quantity of paraffine or white beeswax, put it in a tin with boiling water, and when melted add the proper coloring by mixing with it oil colors from a collapsible tube, such as are made by Winsor & Newton and procurable at any store where artist's materials are sold. Now draw boiling water up into the syringe a few times until it is thoroughly warmed, and then quickly fill it with the hot paraffine and inject the skin of the caterpillar (which should have been previously placed in warm water) to its normal size. If the larva is now put into cold water it will soon harden and will keep its shape. If the paraffine is of the right color, the resemblance to the natural insect will be very striking. Specimens treated in this way are hard but are not nearly so brittle as those inflated and dried with hot air.

Of course, either method requires some careful manipulation; but with a little practice the results, especially with the paraffine, are encouraging. The resemblance to the natural caterpillar will be still nearer if the skin can be painted wherever warts and spots occur. These are frequently red or blue, while the general surface is green. But this belongs more to the professional, and skilful painting can hardly be expected from the amateur.

The chrysalides and cocoons of different kinds are not difficult to preserve and usually look pretty well if simply dried. Some of the translucent chrysalides will be improved if the contents are taken out at the back and the space filled with colored wax or paraffine.

THE CABINET.

Cabinets may be made in a variety of ways with drawers large or small, but they need not be more than one inch deep inside. Basswood makes a nice cabinet as the wood is very light and does not warp so badly as many other woods. The front of the drawers and the front, top and sides of the case may be made of some hard wood, such as oak or cherry, which will take a handsome polish. A useful cabinet, and one which looks well, too, may be made of the following dimensions: Four feet six inches high, four feet wide, and two feet six inches deep from front to back. Two doors in front and a double row of drawers from top to bottom. However, the cabinet should correspond with the owner's taste and what it is intended to illustrate. One may have a very small cabinet and yet with room to spare which will contain the cream of the butterflies of the world. A good many, in fact nearly all butterflies will fade perceptibly if exposed to the light for years, and some of the most delicately tinted moths lose all their beauty if so exposed for a short time. Therefore they must be protected from the light.

Shallow wooden boxes answer nicely for storing the collection temporarily. These may be made very inexpensive, and look well if of uniform size. To own a handsome cabinet for his collection should be the aim of every collector.

HOW TO MAKE A COLLECTION.

COLLECTING BUTTERFLIES.

To make a successful collector of diurnal lepidoptera requires agility and a practised eye. One soon learns to manipulate the net so as to capture the specimens on the wing almost exclusively. This is preferable as the net is less liable to be torn and the insects are taken in more perfect condition than when captured while at rest. After capturing a butterfly and retaining it in a fold of the net, carefully place its wings together back to back, and give the thorax a sharp pinch between the thumb and finger. This will in most cases render the insect inactive and it may be turned out and into the poison jar without injury. It is a good plan to put the specimens in collecting papers before placing them in the poison jar if they are large and fine, as this will protect them from injury by rubbing together. Another scheme which answers admirably is to place small pieces of tissue paper over the specimens as they are put into the poison jar, so that fresh additions may not injure the ones already captured. There will be little necessity to touch the wings of specimens with the fingers when once accustomed to the work; and as more damage is likely to be done at the time of collecting than at any other, care in handling will make a marked difference in the appearance of the collection as a whole. It will rarely be necessary to run much for the insects one desires to capture, for by watching favorable opportunities they may be swept into the net with little more than a few quick steps and a rapid movement of the hand in guiding the net. Some butterflies, however, fly long distances when once on the wing, and one will sometimes get a long run and a glorious sweat in making such a capture. One soon learns to distinguish, while the insects are flying, between fresh specimens and those which are worn or torn; and this, it is scarcely necessary to say, will save the collector many needless steps. Collecting with the net may be commenced very early in the spring, as some species make their appearance before the snow is all gone and from that time on one may find new species coming out every few days.

Low, grassy meadows, with clumps of bushes, are generally favorite haunts of many butterflies. The different species of *Argynnis*,

Phyciodes tharos, *Melitæa phaeton*, *Limenitis disippus*, *Satyrus alope*, *Neonympha canthus*, with two or three species of the genus *Thecla* and many moths, are found in such localities. As the ground is frequently very wet in such places, one must go prepared or else put up with wet feet. The butterflies to be found in the upland fields are among the most common we have, *Pieris rapæ*, *Colias philodice*, *Chrysophanus americana*, *Pyrameis huntera*, *Pyrameis cardui*, *Pyrameis atalanta*, *Danaïs archippus*, etc., being lovers of the open fields. Fields of clover and patches of milkweeds and thistles are particularly attractive to the species named.

I well remember a neglected pasture where thistles and milkweeds grew in scattered clumps, where I have passed many an hour with good success. *Pyrameis huntera*, *P. cardui*, *P. atalanta*, *Danaïs archippus*, and several smaller butterflies flew from blossom to blossom, and were sometimes so intent on extracting honey that I picked them off the flowers with my fingers. The hours between ten in the morning and three in the afternoon were the most favorable, and beautiful fresh specimens were to be found there almost every day. Such a locality, if known to a collector, will furnish him with a great many splendid insects. Among such a number one need take only the most beautiful and perfect, and the duplicates can be used in exchange with foreign collectors for their treasures.

Roadways and along brooks and rivers are sometimes excellent localities for collecting. Butterflies seem to like to fly along roads and running streams, particularly the *Papilios*, *Limenitis arthemis* and *L. ursula*. They will also sometimes congregate on the muddy banks of rivers or about muddy pools in the road where a dozen or more may be taken by one sweep of the net. Several species are in the habit of visiting barnyards, and decaying sweet apples and pears are an irresistible bait for *Limenitis ursula*, *Grapta interrogationis*, *Grapta j-album*, *Vanessa antiopa*, *Pyrameis atalanta* and *Vanessa milberti*.

In the town of Mentor, O., where I passed a portion of my childhood, there was an old cider-mill, and from the time the first sweet apples arrived and were crushed until late in the fall, on every fine day, clusters of butterflies could be seen resting on the heaps of refuse and eagerly sipping the half-fermented cider. What a place that was for a boy with a net! I have seen twenty *Limenitis ursula*, resting on one heap of "apple chankins," opening and closing their purple and black wings in the sunshine, while several other

species of handsome butterflies were no less numerous. At the approach of any one they rose in a swarm, some resting on the sides of the old mill, while others continued to fly until the danger was past and then settled once more to the feast. It would be difficult to tell which occupied the greater part of my attention, the butterflies or the cider. Suffice it to say, that both I and my collecting-jar went home pretty nearly full after a few hours passed at the old cider-mill.

The tops of hills and low mountains are frequented by butterflies; and often when the sides of a hill are poor in both species and individuals, they will be found plentifully on the tops, especially if there is a cleared space in the forest occupied with shrubs and bushes where they may fly about. At such times they may be seen flying in regular circuits, and two or three will often chase each other up into the air until they are almost lost to view.

I remember such a hill near Sonora in California. Starting with a fellow-collector early in the morning of May 15th, we arrived at the top of the hill about nine o'clock. We had seen few butterflies on the way up; but on reaching the top, we found them in hundreds. The air was filled with them, they rested in dozens on every bush. There were not a great many species, perhaps not more than seven or eight kinds in all; but of these we could have taken almost any number, and I caught two cigar boxes full of perfect specimens — perhaps two hundred and fifty insects — before dinner time. A large number were imperfect; and we found a good many dead and dying ones on the rocks and ground. The lizards and ants were making great havoc among the weak and sickly ones, and the ground was littered with their wings. Why they had so congregated I cannot imagine. The gentleman with whom I went informed me that he had found them in this place several years in succession, at the same season of year.

The different species of *Parnassius* are mountain-inhabiting butterflies, and are usually found far up on the sides of high mountains. We have several mountain butterflies which are to be found upon the bare and inhospitable tops of the White Mountains in New Hampshire. Mountain valleys are usually very rich in butterflies; and on a road traversing such a valley the collector will sometimes find a veritable paradise for his labors.

Some butterflies are very combative, and will give chase to every flying object that comes in their neighborhood. They will even fol-

low to near the earth anything which is thrown into the air; and often I have captured insects which persisted in alighting far out of the reach of my net, by throwing my hat in the air and taking them as they followed it down.

When collecting in the woods where butterflies are wild and fly high, one may materially increase his captures by using a decoy, by pinning a dead specimen with its wings spread, in a conspicuous place, the top of a low bush with the leaves stripped off, for instance, and, standing ready with the net, the butterflies may be taken as they fly down and hover over the decoy. A live decoy may be used in the same manner by tying a thread around the body of the insect between the abdomen and the thorax and allowing it to flutter about where it can be readily seen. This method I have used very successfully in tropical countries to capture the superb but wild and high flying *Papilios* and the gorgeous *Ornithopteras*. I have sometimes been obliged to shoot with a shotgun the first specimen for a decoy. A piece of cardboard painted to resemble a butterfly I have seen answer for a decoy, and it has the advantage of durability.

Of some species of butterflies the males will be found to outnumber the females three to one or more in the specimens taken. That there really are so many more males than females I very much doubt, as in rearing specimens from the eggs or the larvæ the sexes seem pretty evenly divided; but possibly, on account of the males being more active and flying more in the open or being frequently more showy, the collector will almost invariably take more males than females of a given species. This discrepancy is shown in the catalogues of those who have butterflies for sale, where the females of some species are often two or three times the price of the males.

The females are usually much larger than the males, and are sometimes, though rarely, richer in their coloring. The males of some species may readily be distinguished from the females by noting the claspers on the end of the abdomen of the former. The females frequently have larger bodies than the males, their abdomens being distended with eggs. There are a good many kinds, however, where these distinctions are not readily seen and the sexes are difficult to separate. In some species the sexes very closely resemble each other, while in others they differ so much as to look like totally different insects. Take *Argynnis cybele* and *Vanessa antiopa* as examples of the former, and *Saturnia io* and *Attacus promethia* as representatives of the latter.

For a collector to capture one hundred species of butterflies in a day in some parts of Mexico, Columbia or Brazil is not an unheard-of thing; but here we have to be contented with a much smaller variety, and to take ten or twelve kinds in good condition is a good day's collecting.

WHEN BUTTERFLIES ARE MOST ABUNDANT.

June, and the latter part of August and the first of September are the best times of the year for collecting in the United States, although many kinds are to be taken at other times.

Between the latter part of June and the first of August there is generally a dearth of specimens, except of the different kinds of *Argynnis*, which are most abundant about the middle of July. This does not apply to the mountain districts, as excellent collecting may be had in the vicinity of Mt. Washington, N. H., the Berkshire Hills, Mass., the Adirondacks, N. Y., Blue Ridge, Va., and the Ozark Mountains, Ark. in July, where a dozen species of butterflies will be found in their prime at that season. The reason for this scarcity of butterflies when one might expect to find them most numerous is that the first brood has all hatched and gone, and the second is at that time still growing in the larval state. A collector may go out with his net at such a time and be well-nigh disgusted at the poverty of a locality which at former seasons has yielded him a fair harvest for his labors. How dull and uninteresting are the fields of grass and clover where not even a common yellow *Colias* or a white *Pieris* flits across the landscape to gladden his eyes. Plenty of moths may be had at this season, but the butterflies are scarce.

I am often asked by persons interested, "How long does a butterfly live?" My answer is: "Some species only a few days, or a week or two at the most; some hibernate and live in a dormant state several months, but their life of activity is very short; a butterfly is at its best only two or three days."

COLLECTING MOTHS.

ASSEMBLING.

This name is given to a method of bringing together numbers of the males of any species of insect by the aid of a virgin female of the same or an allied species.

The different species of the family *Bombyx* may be readily assembled, and a more interesting experience to an enthusiastic collector can scarcely be imagined. Some of the species assembled with little difficulty are among our largest and most handsome moths. *Saturnia io*, *Telea polyphemus*, *Actias luna*, *Attacus promethia*, *Saturnia maia*, etc., are all easily assembled, the method of procedure being as follows: Take a virgin female a few hours after she has hatched from the cocoon, and place her in a bag made of mosquito netting. Hang the bag out of doors on the limb of a tree or other suitable place, and have a light near enough so that you may see the males when they arrive. A warm, dark night with a light breeze blowing will be found most productive; and when the males begin to congregate, the collector will be busy indeed if he manages to catch and take care of half the specimens that come. Sometimes they make their appearance early in the evening, at other times later, and one must do his best when the dance begins.

An experiment which a friend of mine assured me he had tried with excellent success was on a warm afternoon to take the captive female with him on a ramble through the forests and fields, making a circuit of two or three miles about his home, and on returning hang the moth out of doors near his house as usual. He said he had very good reason to think that the males in flying about in the evening came across the scent left by the female as he carried her, and on following it up arrived at his house, where he was on the lookout for them. His success leads me to recommend this method to the collector, as my friend evidently puts a great deal of faith in it.

Attacus promethia and *Saturnia maia* are day flyers, and usually assemble best on warm afternoons, when they may sometimes be taken by dozens. It frequently happens that the first night after hatching a female will not attract the males at all, while they will come in numbers the second night. A good deal seems to depend

on the condition of the atmosphere; for on some nights the scent does not seem to travel well, and on others it must go for miles, judging by the number of specimens that follow it up. It is a fine sight and one worth losing half a night's sleep, to see these great moths, from two to a dozen at a time, circling about the trees or alighting on the grass, all eager to pay homage to the gentle lady in the net. She generally remains quiet or gives her wings a gentle tremulous motion, presumably to attract her dilatory lover, whom she has good reason to suspect has deserted her for some other fair virgin.

One particular evening when we were boys, my brother and I stayed up nearly all night capturing the moths that came to one captive female, *Telea polyphemus*. My mother came out about midnight to tell us that we must stop and go to bed; but she became so interested that she not only gave her consent to our remaining at the work, but actually got her net and joined in the excitement. We took something over two hundred perfect specimens of the males that night. It is a splendid way to capture large and fine specimens for the cabinet, and also to get series showing variety of coloring.

To see *Actias luna*, that lovely pea-green gem of the night, assemble in numbers, is an experience not soon forgotten. The female of this species should be taken to the edge of a forest containing walnut or birch trees and placed in position before dark. One must keep a constant watch over the prisoner, as birds and bats think of entomological specimens only as savory morsels for a meal, and will not scruple to tear the net open to get at the prize, as I have known them to do on several occasions much to my disgust.

But to go on with the methods for collecting: Take a lantern, a net and a poison jar, with a box or a small satchel and plenty of papers. If the night is favorable and the female in the right condition to give off the scent, a very interesting time may be expected. The moths are so light colored that they look almost white in the light of the lantern, and as they flutter down from the trees to where the female is held captive one will almost hold his breath for fear of frightening them. They are not wild, however, and do not seem to notice the collector and his net and lantern.

Cats and skunks take advantage of such chances of procuring a meal, and I remember once having left out all night a female moth in a net, and looking out in the morning to see my lawn strewn with the wings of hundreds of moths which the cats had killed and eaten.

COLLECTING WITH A LAMP.

On warm, moonless nights, especially if cloudy, moths are attracted toward a bright light, and many insects rarely seen at other times may be taken in this way. A second-story window overlooking lawns and cultivated fields, not far from forest trees, makes a good place to try. The lamp should be one which gives a large and brilliant light and be placed on the window-sill with the window wide open, so that the moths may come into the room, where they may be taken with a small net or captured in the poison jar as they rest on the walls or the ceiling. A piazza or balcony with a lamp on a table will sometimes be found to answer the purpose well. In that case place the table and lamp against the side of the house, so that the moths as they fly about will alight on the clapboards near the lamp, where they may be easily captured. The side of the house away from the wind will be found most favorable for this mode of collecting.

The good nights for taking moths in this way are not numerous, and one must make the most of them when they come. Collecting in this manner may be carried on from early May till late in October if the weather is favorable, different species making their appearance at different times. The variety thus to be collected is almost endless, and comprises moths from the minute *micro-lepidoptera* up to the giants of the race, six or seven inches in expanse of wings. One soon learns to recognize the different species by their modes of flight, as they bump their heads on the ceiling of the room in their strange bewilderment. When some much-prized moth enters, close the window, as I have known many a fine specimen to change his mind about adorning one's cabinet with his precious body and fly out of the open window much faster than he came in. To lose a rare and beautiful moth is a keen disappointment to an enthusiastic collector, and such a mishap may often be avoided if this simple precaution be taken.

One may sometimes make grand captures about electric lights, even in cities, by visiting them on warm summer evenings with the net and poison jar. Sphinx moths, which rarely come to a lamp, will often be seen flying in wide circles about the electric arc lights; they are then not very shy and may be easily taken.

While employed in Washington, D. C., I made a splendid collection of the moths of that region simply by going the rounds of a number of electric lights every evening. The lamps about the Treasury Building were sometimes very productive of fine specimens and the broad stone steps and pillars were frequently littered with moths, May flies, beetles, etc., where one could stand and pick out his desiderata with little difficulty. I captured several of the Regal Walnut moths (*Citheronia regalis*) and a number of our largest and handsomest sphinxes. Besides making the acquaintance of a number of insects new to me, I met several entomologists who, like myself, had been attracted to the lights by the abundance of specimens.

SUGARING.

A favorite manner with many collectors of taking specimens is by sugaring or smearing trees, posts, etc., with a strong mixture of rum and molasses, and taking the half-intoxicated moths with the poison jar. This method may be successfully practised during the summer and autumn and will add many new species to the collection.

The mode of proceeding is as follows: Get a pint of strong, dark molasses and boil it down until it is as thick or thicker than ordinary house-paint or gruel. To this add a quantity of rum, whiskey or other strong alcoholic liquor. Care should be taken, however, not to put in enough to make the mixture too thin or watery. After tying a rag on the end of a stick, by way of a brush, the collector is ready to sally forth. Select a locality not far from the woods, and before dark smear the trunks of trees, fence-posts, etc., with the mixture. At dusk the moths will begin to arrive, and the collector, provided with a lantern and a poison bottle, should go the rounds. If the locality is a good one and the night favorable, numbers of moths in all stages of intoxication, from "mildly hilarious" to "comfortably drunk," or even blissfully ignorant of everything about them, and too far gone to be able to wind up their extended tongues will be found about the bait. They are at these times easily taken, simply by placing the poison bottle under them and knocking them into it.

Many *Noctuidæ* and *Phalænidæ* come to such bait, and I know of no better manner of procuring the different species of the large and handsome *Catocala*. Most species of this genus may be

taken in this manner from the middle of August until cold weather. It is useless to try this bait where flowers are abundant, and moths will not come on cool or windy nights. The same trees may be smeared night after night with good results. A small box containing sheets of cotton batting cut to fit it is very useful for this mode of collecting. After a number of moths are captured in the poison jar, they may be turned out into the box and carried safely home between the sheets of cotton. It is best not to allow the moths to remain too long in the poison jar, as they are apt to rub their scales off, very much injuring their appearance.

COLLECTING ABOUT WILLOW BLOSSOMS AND GARDEN FLOWERS.

When the catkins of the willows are in bloom they attract a great many moths; and the collector provided with a bull's-eye light and a poison jar may reap a rich harvest in rare *Noctuidæ* on warm spring evenings. So intent on the repast are many of the moths that the net will seldom be needed. I have in mind one near-by locality where, after a warm day in spring, the moths may be collected by dozens on the willow catkins.

Many species of both butterflies and moths are attracted by fragrant flowers. The lilac, phlox, petunia, syringa, pink and many other common garden flowers are resorted to by butterflies and day-flying sphinx moths in the daytime, and by moths of many kinds at dusk and late into the night. A bull's-eye lantern and a net are needed for their capture after dark. Some of our largest and handsomest insects may be captured in this way, as they remain poised on the wing, tongue extended, extracting the nectar from the flowers. Some of the sphinx moths are very shy, and are liable to leave if the rays of the lantern are turned directly on them. They are apt to flutter a great deal after being captured in the net, so that they should be taken out and quieted as soon as possible, else they may ruin their appearance endeavoring to escape.

I have taken in this manner in a single evening over forty sphinx moths, representing eight species, near one bed of phlox. In some localities I have no doubt that this number can be exceeded, or even doubled, by one who understands the capture of these fine insects.

COLLECTING CATOCALA.

Catocala are sometimes found in numbers in the forest on the trunks of trees; and when a collector is fortunate enough to run across such an assemblage he should make the most of the opportunity, as it is not likely to occur very often in one's experience. The different species of *catocala* so closely resemble in color and markings the bark of certain trees, that it is next to impossible to see them. Oak groves seem to be their favorite haunt, and the tree trunks for the space of an acre or two are sometimes well peopled with them. They are so shy that one must use the greatest caution in their capture. They are best taken by placing the mouth of the poison jar over them as they lie with folded wings feeling secure in their striking adaptability in color to the moss-covered bark. Many species may sometimes be taken in one locality; but they are all wild and very rapid flyers, so that it is difficult to capture them on the wing. It is best not to undertake their capture with the net for another reason: I refer to their liability of injuring themselves in their desperate efforts to escape. A poor specimen is little better than none at all for exhibition purposes; in fact, I regard one really beautiful, perfect specimen nicely mounted, of more value than one dozen worn and mutilated ones. To view a collection of fifty fine and perfect insects will give a naturalist more pleasure than to look over a whole cabinet full of rubbish collected with no care and mounted in a slovenly manner.

The greatest care is necessary in handling the *catocala* as their scales come off with a touch, leaving bare and unsightly patches. *Catocala cara* and *C. concumbens* are often found under bridges over rivers and brooks, hanging back downwards from the boards or stones. One bridge a mile from my home has furnished me with many excellent specimens of the two species named; and I rarely go there in the season but I find from ten to thirty of these insects. It is useless to look for them in such localities before the middle of August. The same species may also be found on the underside of tree trunks which overhang the water.

The *catocala* often frequent rocky ledges and stone walls where the gray color of the upper wings of some species harmonize with their surroundings.

GATHERING CHRYSALIDES AND COCOONS.

The larvæ of many moths go into the ground to pupate, where they remain (many of them) during the winter. At the approach of warm weather they work their way to near the surface where the perfect insect can easily find its way out. At such times they are easily found by raking over the fallen leaves under the trees in close proximity to their trunks. Scattered groves of large trees are likely localities in which to hunt for chrysalides in this manner; and pines, oaks, poplars, willows, elms, etc., are reasonably sure to furnish treasure for the searching.

A stout, forked stick makes a good tool with which to work, and a box containing leaf mould answers well for a depository for the specimens, in which they may be left until the flies emerge. The cocoons of a variety of moths may be found attached to the twigs of the trees on which the larvæ feed, after the leaves have fallen in the autumn. Wild cherry and sassafras will sometimes be found with a number of cocoons attached, while oaks, elders, birches, maples, and numerous other trees and shrubs will each yield their reward for diligent search. The naked chrysalides of butterflies are often attached to fences, walls and houses besides the stems of the food plants of the larva. The chrysalides of many butterflies are exceedingly difficult to find, and with some species it is only by most diligent search that success may be attained. If one wants to make a trial, let him begin with one of our most common butterflies, *Colias philodice*, which abounds everywhere in fields and meadows in summer. See how many hours of patient exploration are necessary to find the first chrysalis; while to locate in the pupa state *Argynnis idalia*, *Melitæa phæton*, *Limenitis ursula*, *Papilio turnus* and others of our well-known butterflies may require many days of study and careful search.

TO REAR SPECIMENS FROM THE EGG OR THE LARVA.

Many species of lepidopterous insects are easily reared from the egg or the larva.

One may procure the eggs of some butterflies and moths simply by enclosing in mosquito netting a fertilized female with a branch of the plant upon which the larvæ feed. Some insects, however, cannot

be induced to lay their eggs in this manner; and sometimes it is only by watching the female at liberty depositing her eggs that they may be had at all. Many of the eggs are smaller than the head of a *doll's* pin, and are frequently attached to the underside of the leaves of the food plant, so that diligent and careful search is necessary to find them. Most of them are covered when first laid with a gum or varnish which when dry securely fastens them to the objects upon which they are deposited.

The number of eggs laid by a single female varies from one hundred to five or six hundred or more, according to the species. They are often laid singly, especially by the butterflies; but a large number of the moths deposit their eggs in a compact patch and in regular rows so close together that they touch each other on all sides.

The eggs deposited during the warm days of summer soon hatch, while those of autumn remain unchanged until the following spring.

The heat of summer and the cold of winter seems to have no injurious effect upon the eggs of butterflies and moths; and if it were not for the army of creatures whose life work it is to keep these hosts in check, every green thing in the way of vegetation on the face of the earth would be devoured.

Just before hatching, an egg frequently assumes a leaden hue, and the young larva eats his way out of his prison and escapes, often devouring before he goes the egg-shell which has sheltered him. At this stage the larva is frequently very unlike the mature caterpillar. He should now be placed in a glass jar with an inch or two of moist loam at the bottom, with young and tender leaves of the food plant. He will have a sufficiency of air if the cover is kept on, and the leaves will be kept fresh longer. Care should be taken not to place the jar where the direct rays of the sun will shine on it, as the temperature may become too great. One may introduce into the jar a small bottle of water, holding the leaves if this is desired; but the mouth should be plugged with cotton or the larva may fall into it and be drowned. The caterpillar will grow rapidly, and will require a good deal of fresh food. For this reason it is best when it is one-third grown to place it on a branch of its food plant and enclose the whole in mosquito netting.

In rearing quantities of larvæ a barrel without either head may be placed over a bush and all the branches brought up through the top. Then after enclosing the branches which protrude in mosquito netting and introducing the larvæ to be reared, fasten the

netting securely round the top of the barrel. This simplifies the rearing of larvæ and gives them conditions almost exactly the same as they enjoy in a free state. A great many specimens may be reared at one time in this simple manner.

If the insects are earth-loving species and desire to complete their transformations in the ground, they must have an opportunity to do so, and should be placed in a box with loam when fully grown.

Many will spin cocoons, others will attach their naked chrysalides to the twigs of the food plant. Great care must be taken with the larvæ to protect them from their natural enemies, the ichneumon flies, which are constantly on the watch for an opportunity to deposit their eggs in or on them. For this reason they should not be exposed out of doors unless covered with fine-meshed netting.

The cocoons may be kept in a wooden box in the cellar during the winter months. The naked pupa, including those which have transformed in the soil, may be placed in tin cans (ordinary fruit cans will answer) without any soil or loam and kept in the cellar also. These should have the covers put on to prevent the pupæ becoming too dry, as they are almost sure to do if not covered tight. In this way their preservation is a simple matter, and their loss by drying or mould is completely done away with. In the spring the cocoons may be tied on strings and hung in the attic, where they will hatch without trouble.

The naked pupæ may also be removed to the attic and allowed to remain in the tin cans until a short time before the fly should emerge, when the pupæ may be placed in a good-sized wooden box, on (not in) damp earth, with a few leaves covering them, and allowed to hatch. The box may be covered with netting to prevent the escape of the perfect insects. A few twigs placed among the chrysalides will enable the newly hatched flies to suspend themselves so that their wings will develop in the normal manner.

CLASSIFICATION.

The following order of classification, adopted mostly from that of Mr. Henry Edwards, will be used in this work.

ORDER LEPIDOPTERA. Moths and Butterflies.

SUB-ORDER HETEROCERA. The Moths.

MICRO-LEPIDOPTERA.

<i>PTEROPHORIDÆ</i>	Plume Moths.
<i>TINEIDÆ</i>	True Moths.
<i>TORTRICIDÆ</i>	Leaf Rollers.
<i>PYRALIDÆ</i>	Snout Moths.

MACRO-LEPIDOPTERA.

<i>GEOMETRIDÆ</i>	Loopers or Spanners.
<i>NOCTUIDÆ</i>	Owlets or Moth Millers.
<i>BOMBYCIDÆ</i>	Spinners.
<i>ZYGÆNIDÆ</i>	Zyganids.
<i>ÆGERIDÆ</i>	Glass-wings.
<i>SPHINGIDÆ</i>	Dusk-flyers.

SUB-ORDER RHOPALOCERA. The Butterflies.

<i>HESPERIDÆ</i>	Skippers.
<i>LYCÆNIDÆ</i>	Blues, Coppers, Hairstreaks.
<i>SATYRIDÆ</i>	Wood Nymphs, Browns.
<i>NYMPHALIDÆ</i>	Angle Wings, Silver Spots.
<i>PAPILIONIDÆ</i>	Whitelings, Yellows, Swallowtails.

HETEROCERA. *The Moths.*

In this group of insects the antennæ are of various shapes, generally terminating in a point, while the wings are usually folded roof shape over the abdomen when the insects are at rest.

Many of the species have a bristle attached to the upper edge of the hind wing near the body which fits into a loop in the lower edge of the upper wing for the purpose of holding the wings together during flight. By turning the insect upside down and spreading its wings the bristle and loop may be readily seen.

Many of the species are extremely minute, the aid of a microscope being necessary to study them, while a few are gigantic in comparison, being among the largest and grandest insects known.

Many are plain in color or their coloring is soft and blended, while a few rival the gayest and richest butterflies. Most of the species fly by night, a few love the hottest sunshine, while others prefer the dusk of morning and evening.

Their geographical range is very great. They abound in the tropics in countless myriads while species of this group have been seen in the cold and barren wastes of the most northern polar lands. They are found in every land and under all conditions of climate, either as the perfect insect or as the egg, larva or chrysalis.

Some species make cocoons in which to pupate; many burrow in the ground or hide under leaves in the forest.

Most of the caterpillars of moths feed on the leaves of plants, some in the stems and trunks of trees, while some devour fruits. The small kinds, probably best known to the thrifty housewife, devour woollens, feathers and furs.

The moths outnumber the butterflies many times and between five and six thousand species are natives of America north of Mexico.

These insects are nearly all, except the silk producers, directly injurious to man's interests; the parasites and insectivorous birds and mammals keeping these vast hosts in check.

MICRO-LEPIDOPTERA.

A few only of the innumerable species belonging to the four groups representing the micro-lepidoptera will be mentioned and figured in this work. The detailed study of these minute creatures belongs to the specialist, and even he can only hope to become well acquainted with the species of a few genera.

PTEROPHORIDÆ.

The *Pterophoridae*, or plume moths, have the wings divided into plumes or feathers. Their bodies and legs are slim, and the creatures are so delicate as to be difficult to capture and preserve without injury. Most of these insects are night flyers and may be met with from early in the spring till late in the fall.



Various Forms of Plume Moths.

The caterpillars are hairy and spin no cocoon, changing to a naked chrysalis suspended from the end of the abdomen. The chrysalides of some species of these moths are also hairy.

*Pterophorus pentadactylus.*

The white plume moth (*Pterophorus pentadactylus*) is not a common insect in the East, but I have taken it on a few occasions with a lamp in June and July, and have seen it often in Northern Ohio and Virginia in those months. It flies slowly and is so exceedingly

fragile that the greatest care is necessary in handling it. The larva is said to feed on the tender leaves of the convolvulus; but I have never seen it and know nothing of its habits. The moth has an expanse of wing of about seven-eighths of an inch in a good-sized specimen, but is often smaller. The upper wings are two-lobed or plumed, and the hind wings three. The insect is often a pure silvery white. Sometimes, however, its wings are sprinkled with a few gray scales. The legs of the moth are so long, and it stands so high when at rest, that it bears a slight resemblance to a crane fly, and would hardly be thought to be a moth at all by the novice.

We have a number of species belonging to this family but this is one of the largest and most easily recognized.



Alucita hexadactyla.

The six-plumed moth (*Alucita hexadactyla*) is a common American species, being also found in Europe. Its expanse of wing is about half an inch, and each wing is six-plumed, being yellowish-gray in color with brown markings, and a black dot at the end of each feather or lobe. The caterpillar feeds on the flowers of the honeysuckle, is of a reddish-salmon color, and, unlike most of the other species of this group, spins a silken cocoon. The moth is said to hibernate during the winter.

TINEIDÆ.

The *Tineidæ* are mostly very small moths, and the number of species belonging to the group is very large. Many of these insects are gayly, some magnificently, colored; but a microscope is needed to see their beauty. Their wings are narrow and pointed, and are fringed with long delicate hairs. The larvæ of these moths are minute creatures; and many of them are leaf miners, so called because they burrow in the leaves just below the surface, and make long and crooked passages widening as they advance. Some species bore in plant stems, some attack grain stored in houses, some mine in the roots of plants, some few produce galls, and some make sad havoc in our houses among woollen goods or feathers, if left where they can procure access to them.

Tinea flavifrontella,—the common clothes moth, is found in our houses in summer, and may frequently be seen flying about our apartments at night. It is of a light yellowish color and has a silky appearance.



Tinea flavifrontella.

The larva is whitish and does great damage to woollens, using the material on which it feeds to make its pupa case.

Numerous moth destroyers are used to exterminate this pest. Camphor, naphthaline, benzine, snuff and corrosive sublimate may be all used with effect; but common kerosene oil is perhaps the simplest, cheapest and most effective. When woollens are to be put away for the summer, sprinkle kerosene oil profusely in the bottom of the trunk or box in which they are to be packed and after it is filled lay over the goods a paper saturated with it and close the whole up tight. When it is desired to use the clothes once more, a few hours' exposure to the air and sunshine will remove all smell of the kerosene.



Tinea granella.

Tinea granella is a creamy-white moth with brown markings on the upper wings one-half an inch in exposure, and the larvæ live in our granaries, where they entail great loss if left undisturbed.

The female moth lays its eggs upon the grains of wheat, and the worms eat their way into the grains, reducing them to shells and binding masses of them together with their webs. The larva, according to Curtis, makes a cocoon composed of web and wood-pulp in which it hibernates during the winter, changing to a chrysalis in the spring and soon after emerging a moth.



Hyponomeuta millepunctatella.

In *Hyponomeuta millepunctatella* the larvæ are gregarious and spin cocoons. The moth is three-fourths of an inch across the

expanded wings, the fore wings being white with black dots, the hind wings dark gray.



Depressaria robinella.

Depressaria robinella. This moth expands three-fourths of an inch. The head and fore wings are reddish-brown spotted with yellow. The hind wings and body are gray. The green larvæ live on the leaves of the locust and spin their webs among the leaves drawing them together. They are very active creatures and in searching for them by pulling their webs apart they are very liable to wriggle away. The larvæ are said by Packard to pupate among fallen leaves on the ground.

The genus *Nepticula* contains many very minute and yet many very beautiful species. To this genus belong the smallest of all known lepidopterous insects, many of them less than an eighth of an inch in expanse of wing. The larvæ of these minute insects mine in the leaves of different species of trees.

TORTRICIDÆ.

The leaf-rollers, so called because the larvæ of most of the species of this group of moths form the ends of leaves into rolls for their protection, are a numerous family, represented by many species in this country.

The fore wings of these moths are broad and are often brilliantly colored, while the hind wings are usually sombre.

Some of the larger species are gregarious in the larval state, uniting a number of leaves by webs, among which they feed and



Various Forms of Leaf-rollers.

finally pupate, leaving the empty shells of their chrysalides protruding from the webs.

Lozotænia cerasiavorana is about one inch across the expanded wings, which are of an ochre-yellow color crossed by brownish markings.

The larvæ of these insects are gregarious and live on the leaves of the choke-cherry, their unsightly nests with the yellowish-brown shells of their chrysalides attached to the outside of the webs by their posterior ends may frequently be seen by the roadside. The moths often remain about or upon the nests several days after hatching.



Lozotænia cerasiavorana.



Lozotænia rosaceana.

Lozotænia rosaceana expands nearly an inch in a fine specimen. The fore wings are light brown crossed by bands of reddish-brown and the hind wings are light yellowish brown. The larva is said by Packard to bind together the leaves of the rose, apple and strawberry with a few silken threads. The insect is double brooded, one appearing in June and another in August.



Antithesia pruniana.

Antithesia pruniana is five-eighths of an inch in expanse, and the fore wings are marbled with black and lilac with white on the outer portion. The larva lives on the plum, and is a native of Europe as well as this country, doing considerable damage.



Carpocapsa pomonella.

Carpocapsa pomonella is the famous codling moth, the larvæ of which often does so much damage to the apple and pear crop, living in the interior of the fruits and causing them to drop to the ground when only partly grown. The moth is half an inch in expanse and is dark brown in color.

PYRALIDÆ.

The *Pyralidæ*, or snout moths, may be recognized by the long fore wings, their long legs and elongated bodies. Many of them also have the palpi very much elongated, from which they derive their common name. Some species are day flyers, others fly at dusk and still others fly at night and are purely nocturnal. Some of them are white and silvery in appearance, while their wings are bordered



Various Forms of Snout Moths.

or streaked with bands of gold, others are gray or brown, often of a silky lustre, while some are black with white spots. While at rest many species fold their wings close to and partly around the body, giving them a tubular form. Many of the larvæ feed upon grass and clover, while some devour the leaves of the grape, and one interesting but very destructive species infests the comb of the honey-bee often ruining all the comb in a hive.

*Galleria cereana*

This species, *Galleria cereana*, is gray and purplish-brown in color, and the larvæ pupates among the honey-combs, where it has constructed its silken galleries. This insect is double brooded.

*Crambus girandella*.

Crambus girandella is satin white with a broad gold band on the fore wings. The larva is whitish or gray, of a silky appearance and feeds upon grass or clover. This insect is sometimes very abundant, and I have seen the whole front of a house where a bright light was kept burning during the night so covered with this species as to look silvery white at a distance of a few feet.

*GEOMETRIDÆ.**Loopers or Spanners.*

The insects belonging to this group are easily distinguished by their slim bodies and broad thin wings, which, when the insects are at rest, are spread out flat, scarcely overlapping at the edges. The coloring is usually soft and delicate in tone, being often brown, gray-green or buff, crossed by darker wavy lines. The antennæ are often feathery (pectinated) and the legs usually slim and long.

The larvæ, from which the group derives the name of *Geometridæ*, or "earth measures," are readily distinguished from the larvæ



of all other moths by their peculiar mode of progression, which is by bending the body into loops, thus giving the appearance of measuring the ground over which they travel.



Larvæ of geometrid moths.

From four to six of the abdominal legs possessed by the larvæ of most lepidoptera are wanting in this group, in consequence of which the larvæ of geometrids may be recognized at a glance. Many of these larvæ spin silken threads wherever they go and are ready to quit their hold and drop from the leaves on which they may be feeding whenever danger threatens, mounting their threads and resuming operations again when it is past. Some of the caterpillars spin slight cocoons beneath leaves at the trunks of trees, while others burrow into the ground and there undergo their transformations.

The insects of this group are numerous both in species and individuals, and specimens may be taken from the first warm days in spring till late into the fall.

Angerona crocataria is a yellow moth with light brown markings, and expands from an inch and a half to two inches. The larva feeds



Angerona crocataria.

on the currant and strawberry and is yellowish or light green, with brown dots and markings. The perfect fly may be found among low bushes near cultivated fields during June, and, like many other moths of this class, it flies a good deal in the daytime.



Brepbos infans.

Brepbos infans is one of the first moths to appear in the spring and is a northern species, being found throughout New England and north into Labrador. It is a day flyer, and may be taken in the latter part of March or the early part of April before the snow has left the ground. It prefers low, bushy districts, where alders and willows abound, and in favorable localities may be seen in some abundance though generally shy. It is a pretty moth, about one and a quarter inches in expanse, the fore wings being brown with light gray markings, while the lower wings are red with brown margins. The caterpillar is unknown to me.



Anisopteryx vernata.



Anisopteryx autumnata.

Anisopteryx vernata and *Anisopteryx autumnata*, the spring and fall canker-worm moths, have in the larval state long been a seri-

ous pest in different parts of the country, as they frequently appear in such numbers as to completely strip the foliage from apple, elm and other trees, leaving them as if devastated by a conflagration. These moths are about one and a quarter inches in expanse of wing.

As the females of these two species of moths are wingless grub-like creatures, and can only deposit their eggs on the trees which form the food of the larvæ by climbing their trunks, it would seem that their destruction is a simple matter. Still one sees whole districts wherein fruit and shade trees have been stripped of their foliage, in spite of the precaution of encircling the trunks with bands of tar paper smeared with tar or printer's ink. The spring canker-worm moth makes its appearance early in April, and the males may then be seen in numbers fluttering against the windows of a well-lighted room. By going out with a lantern the females may be found ascending the trees to lay their eggs, the males hovering about.

The moth of the fall canker-worm emerges from its cocoon, which is spun beneath the ground, late in October. The spring canker-worm makes no cocoon, but hollows out an oval cavity in the soil in which it passes the winter as a chrysalis. These two species resemble one another closely, both in the larval state and as the perfect fly, the fully developed insects being light gray and brown with light lower wings.



Zerene catenaria.

Zerene catenaria, beautifully white, with black markings and dots, is not uncommon in our fields and among low shrubs in September and October. It is feeble in flight, and is often quite local. In expanse it will measure about one and a half inches. I have never seen the larvæ, but have found the thin, transparent cocoons attached to low shrubs, and have hatched the moths.

The larva of *Amphidasis cognataria* feeds on the maple and currant, and, like the full-grown moth, is thick-bodied for a geometrid.



Amphidasis cognataria.

The moth is dark gray, speckled and marked with black, and about two inches in expanse.



Rheumaptera hastata.

Rheumaptera hastata is a black-and-white moth, little more than an inch in expanse, easily recognized from the other species of this class. It may be found in June along roads in the woods, where it flies in the daytime, much like a butterfly. This insect is said to be widely distributed, being found in Europe and Asia, as well as America. The caterpillar, which is dark brown, feeds on the leaves of the birch, where it lives in colonies.



Hybernia tiliaria.

This moth, *Hybernia tiliaria*, about two inches in expanse, resembles the canker-worm moth, in that the female is wingless and that it is in the larval state destructive to fruit and shade trees. The larvæ are yellow, with black lines on the back and sides, and are sometimes so plentiful as to completely denude trees of their foliage. When

fully grown the larvæ descend into the ground, where they transform to pupæ a few inches below the surface. The perfect insect makes its appearance in October. It is light buff-yellow with orange spots, while the hind wings are nearly white.



Petrophora diversilineata.

Petrophora diversilineata is a very pretty moth, which often makes its way into our rooms at night. It is yellowish, with a slightly red or pink shade on the outer half of the fore wings; which are crossed by a number of reddish-brown lines. The lower wings are lighter near the body with a few brown lines near the lower edge. It is about an inch and a half in expanse of wings. The larva lives on the leaves of the grape, but rarely in such numbers as to do much damage.



Hæmatopis grataria.

During August the pretty little moth, *Hæmatopis grataria*, may be found in meadows, especially near streams, where it is sometimes quite abundant. It has a wide range, as I have taken it in Iowa, Ohio, Virginia, and the New England States. The moth is about one inch in expanse. It flies a good deal in the daytime, soon alighting after it has been flushed from the grass. Its colors are yellowish-red crossed by bands of pink. The larva is said to feed on chickweed.



Geometra iridaria.

An exceedingly beautiful little moth is *Geometra iridaria*. About one and a quarter inches in expanse of wings, it is of a rich

shade of green, the wings being crossed by white lines edged with purple. There are a number of green moths belonging to this group which resemble one another closely, but this is the most attractive in coloring, and were it as large would rival the beautiful *Actias luna*. I know nothing of the life history of this moth, but have often been charmed with its beauty as it flew in at the open window to my lamp.

Among the many geometrids to be found in our country I may mention the following species, as shown in the illustration.

Endropia marginata, having all wings yellowish-buff, bordered with a broad band of light brown. Expanse one and three-quarters inches. This moth may be taken with a lamp early in September. A smaller moth, *Endropia hypochraria*, has brownish-gray wings with brown markings. It expands about one and a half inches.

In *Eutrapela clematata* we have a moth with brownish-gray wings the inner part darker crossed by brown and light gray lines. It expands one and three-quarters inches. *Eutrapela transversata* is light brownish-yellow, with distinct lines and markings of brown. Expanse nearly two inches.

Acidalia ennuclata is creamy-white with brown markings near outer edge of wings. Expands one and a quarter inches.

A finely marked moth, *Therina seminudaria* is light gray with wings crossed by yellowish-brown and yellow lines. Expands one and three-quarters inches.

Before leaving this interesting class of insects, having figured and described only a small number of the more common species, a few words in regard to the wonderful protective coloring, shapes and habits of some of these moths and their larvæ may prove interesting to the student of entomology. The thin, flat wings of these moths enable them to conceal themselves, not by folding the wings up close to the body as so many other species do, but by spreading them out flat on the objects on which they rest, hugging so closely to their support as to appear to be a part of it. Some of the species closely resemble patches of lichens when flattened against the trunks of trees, the lines and bits of color on their wings helping out the resemblance to such an extent that when discovered, one is sometimes half in doubt where the insect leaves off and the bark begins. The green species, many of them, extend their wings on the green leaves, lying so close to the surface as to be scarcely distinguishable.



Eutrapela clematata.



Eutrapela marginata.



Therina semihundaria.



Eutrapela hypochloraria.



Acidalia eunucleata.



Eutrapela transversata.

GEOMETRID MOTHS.

Some yellow and brown species have the habit of resting with wings extended on the upper sides of leaves so as to almost exactly resemble the brown and withered patches on half-dead foliage. One or two kinds when at rest throw their bodies into curious attitudes, at the same time bending their wings into such shapes that when seen one can hardly believe they are anything but dead fragments of leaves adhering to stems.

The larvæ of this group of insects are many of them protected both by their shape and coloring, and even by their habits in a remarkable degree. A large number closely resemble twigs, and will remain standing out straight at an angle of forty-five degrees from a branch, holding on by their posterior claspers for hours at a time. So closely do these caterpillars resemble the small stems of plants with their minute knots that one may have to pick them from the branch to be sure he is not mistaken.

One does not need to go far from home to come across examples of protective mimicry as striking and as useful to contemplate as any the world affords, and a study of the geometrids in both their larval and mature state will point as clearly to the law by which every animal is just adapted to its surroundings and protected in a degree from its enemies as any so charmingly used by the great naturalists Charles Darwin and Alfred Wallace to illustrate the law of natural selection.

NOCTUIDÆ.

Owlets, or Moth Millers.

The moths belonging to this large group are stout-bodied and rapid-flying insects, and are, as their name implies, seldom seen on the wing except at night. When at rest they fold their wings over the body, roof-shaped, in such a way that the lower wings are entirely concealed. Their antennæ are long and tapering, and their wings are always fastened together by the loop and spur already mentioned in another chapter. Most of these insects are sombre in coloring, browns and grays being the predominating colors. Many of them are thickly covered with long hair-like scales, which are easily loosened. The thorax is frequently tufted; and the legs covered with long scales are sometimes provided with spines at the joints. Most of our native species are of small or moderate size, but some of the

exotic species are gigantic, specimens of *Erebus strex* from Brazil sometimes measuring twelve inches from tip to tip of the expanded wings.

Great difficulty is experienced in identifying many of the small and plain-colored insects belonging to this group, as they are frequently very much alike both in shape and markings, and puzzling varieties in colors are common.

The larvæ are usually smooth, though some are hairy, and a few possess tubercles and warts. They are generally provided with sixteen legs. Some make cocoons in which to transform to the chrysalis state; the majority burrow into the ground and form smooth, naked chrysalides. Many of the caterpillars feed exclusively by night, hiding by day, and a number of species are among the principal insect pests with which the gardener and farmer have to deal.

Our first example is the splendid moth *Erebus odora*, which expands six or seven inches and is occasionally taken as far north as Canada. It is a rare visitor, and one may consider himself exceedingly fortunate who captures a good specimen, for it is said not to live in the United States except as a wanderer from Mexico. I have never taken a specimen, but know of several instances where they have been captured in New England and the Western States. The insect is not rare in Mexico; and one rarely sees a collection from that country which does not contain one or more specimens of this fine moth.

The predominating color is dark brown; but in certain lights, pink and metallic purple and blue are reflected from the wings.

There is frequently a good deal of variation in this species, sometimes the wavy lines running across the wings being almost white and again obscure gray or yellowish brown. This insect is a very strong flyer, as specimens are said to have been taken on board a ship, one hundred and twenty-five miles from the nearest land. I know nothing of the larva or of the life history of the insect.

In *Parthenos nubilis*, the insect looks very much like the *Catocala* and has much the same habits. The upper wings are dark brown, black, gray and creamy-white. Thorax and body light brown. Lower wings blackish-brown with four wavy and somewhat indistinct bands of yellowish-orange. Expanse of wings two and one-half inches. I have specimens of this insect from New England and the Middle and Western States. It may be taken in the company of *Catocala* and seems to have a wide range.



Erebus odora.

The genus *Catocala* is very well represented in this country, and is of more interest to the collector than any other class of the Noctuidæ, both on account of the large size of many of the species and also for their great beauty. These insects frequently measure three inches or more across the expanded wings. The upper wings are usually brown or gray with numerous zigzag lines running across them, while the lower wings are frequently crossed with broad black bars, alternating with bands of red, yellow or white. The lower wings are hidden from view when the moths are at rest. The larvæ feed on various forest trees, oak and hickory being their most common food plant. Both the larvæ and the perfect moths are protected by their resemblance in color to the bark of trees, and only careful and diligent search will enable one to find them. There are eighty or more species of this genus native to this country, and a large number of varieties which have been given separate names. The identification of some of the species is difficult, both on account of their variation and the obscurity of their markings.

Catocala cara is one of the most common moths of this genus as well as one of the largest and finest.

It loves to fly along water-courses at night, particularly where they are bordered on either side with forests, and on this account may often be found in the daytime hiding on the underside of the boards and beams of bridges, and I have myself taken thirty-seven specimens of this fine moth under one bridge in less than an hour. If one knows of such a place, he may visit it every day from the middle of August to the last of September and be tolerably certain of finding specimens of this and sometimes one or two other species. Where trees overhang the water, too, one may look for this insect with good chances of success in finding it.

The larva of this insect lives on willow and may sometimes be found descending the trunk of a tree preparatory to burrowing under the leaves to undergo its transformations. The scales of all these moths seem to be very loosely attached, and the greatest care is necessary in handling them. I make it a rule never to touch one with my fingers for fear of injuring it. When a moth of this kind is seen on the trunk of a tree do not try to use the net for its capture but place the open end of the poison jar over it and when it flies into the trap put on the cover and the insect is safe. Each specimen should be taken out and placed in an envelope or collecting paper before another one is put into the jar. Although many of the *Cato-*

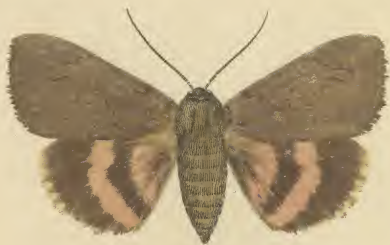
cala may be enticed into one's room on warm evenings in August, by placing a light in the window, I have never yet taken *Catocala cara* in this manner; nor does it seem to be attracted by sugaring, and if one had to depend on this mode of capture he would conclude that it was a rare insect.



Catocala relieta.

This is one of the finest and rarest of the *Catocala*. The upper wings of the male insect are creamy-white, crossed by several indistinct bands of gray; the lower wings are black, with a white curved bar crossing just below the middle and a creamy-white fringe at the margin. The head is light; but the thorax and abdomen are dark gray, almost black. The upper wings of the female are much darker, although specimens may be found ranging from almost pure white to dark gray. A fine specimen of this rare moth will measure nearly four inches across its expanded wings, and it is enough to make one's heart jump with excitement to see one of these strikingly marked insects quietly sipping the intoxicating liquid where one has smeared a tree-trunk with rum and molasses.

Like many other species of the genus *Catocala*, this insect is local, and may sometimes be found in some abundance. One collector with whom I am acquainted has taken a dozen perfect specimens in a season, but this must be considered very unusual. I have always found it a very scarce insect. It is widely distributed, as I



UPPER SIDE



UNDER SIDE

CATOCALA CARA

have had specimens from New England, Ohio, Illinois, Arkansas and Virginia.



Catocala concumbens.

Although common, *Catocala concumbens* is a very attractive insect. Its forward wings being a soft gray, while two bars of black and two of pink adorn the lower wings. This moth may be taken by sugaring, and it will also come to a light, and is a pretty creature for one to see coming in at his window fluttering its wings of black and pink just in front of his face. This insect is probably found over a large part of this country, as I have specimens from many localities. Stone walls or heaps of rocks in the woods seem to be favorite haunts of this moth; and as the bright pink lower wings are covered by the gray upper ones when at rest, it is not easily discovered. Two and three-quarters inches is the expanse of wing of a good-sized specimen. The caterpillar lives on willow.



Catocala epione.

A number of the *Catocala* have no bands of bright color on the lower wings, but these members are simply black or dark brown with a white fringe, while the upper wings are very like those insects I have been describing. The present species is one of this class, and there are a large number so closely related that their separation into species is not an easy matter.

These moths inhabit oak woods, generally in company with other kinds, and are most often to be found in the daytime hugging closely to the trunks of the trees where their gray wings marbled with dark brown and black render them difficult to see. When once alarmed they readily take to flight and are strong and rapid on the wing. This species may be taken by sugaring but rarely comes to a light. The larva lives on oak.



Catocala fratercula.

The little *Catocala fratercula*, which much resembles some of the larger kinds, is often abundant in oak woods in August, where it may be found in company with the larger species. Its fore wings are light gray, with creamy-white and brown patches and markings, and its lower wings are orange banded with black. One will often find this moth on fences and stone walls as well as tree-trunks. Half-a-dozen or more species of the same size may easily be mistaken for this and the beginner will encounter many difficulties in separating the species of *Catocala*. The larva lives on oak.

The moth *Catocala cerogama* has upper wings gray and brown, with black markings. Thorax gray. Body brown. Lower wings brown near the body, the rest being black crossed by a single narrow band of dull orange, edged with yellowish-gray. This insect expands a trifle over three inches. I have not found it a common specie, but have specimens from Arkansas, Ohio, Massachusetts and Ontario, Canada.

In *Catocala parta* the upper wings are gray, light brown and black. Thorax gray and black, body light brownish-buff. Lower wings orange-red with one narrow and one broad black band, the outer margin yellowish-gray. The insect expands three inches and a half in a fine specimen. This is not a rare insect, and I have taken it in Massachusetts, Southern Ohio and Illinois, and have specimens from Ontario, Canada.

Catocala subnata. Upper wings gray and light brown. Thorax light gray, body yellowish-brown. Lower wings ochreous-yellow

Catoxoa unifuga.



Catoxoa parva.



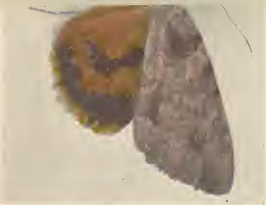
MOTHS AND BUTTERFLIES OF THE UNITED STATES.

ERRATA NOTE.

The plate attached hereto is to replace the one issued in Section II., to be inserted in the book as cancelling pages 65 and 66.

BRADLEE WHIDDEN, Publisher.

ata.



parva.



These moths inhabit oak woods, generally in company with other kinds, and are most often to be found in the daytime hugging closely to the trunks of the trees where their gray wings marbled with dark brown and black render them difficult to see. When once alarmed they readily take to flight and are strong and rapid on the wing. This species may be taken by sugaring but rarely comes to a light. The larva lives on oak.



black. Thorax gray and black, body light brownish-buff. Lower wings orange-red with one narrow and one broad black band, the outer margin yellowish-gray. The insect expands three inches and a half in a fine specimen. This is not a rare insect, and I have taken it in Massachusetts, Southern Ohio and Illinois, and have specimens from Ontario, Canada.

Catocala subnata. Upper wings gray and light brown. Thorax light gray, body yellowish-brown. Lower wings ochreous-yellow



Catocha parva.



Catocha cerogma.



Catocha unijuga.



Catocha subnata.

NOCTUID MOTHS.

crossed by two bands of black. Expanse nearly three and one-half inches. I have never taken this insect, but have specimens collected in Southern Ohio.

Catocala unijuga. Upper wings dark gray and black with light gray wavy lines. Thorax dark gray. Body brown. Lower wings bright orange-red, edged with white and crossed by two intensely black bands. Expanse of wings three inches. This is a common insect in the northeastern part of the country, and I have a number of specimens from Canada.

The species, *Catocala innubens*, is a very variable one. The upper wings are usually dark brown, light brown and black. Thorax and body light brown. Lower wings reddish-orange edged with yellow and crossed by two bands of black. This insect expands two and one-half inches and is sometimes found in numbers on oak-trees. I have specimens from Iowa, Ohio, Massachusetts and Ontario.

Catocala flebilis. Upper wings dark gray and sooty black. Thorax dark gray. Body sooty brown. Lower wings black, edged with yellowish-white. Expanse two and a quarter inches. A common insect in oak woods in September and October.

Catocala desperata. Upper wings light gray and light brown and crossed by black lines. Thorax light gray. Body sooty brown. Lower wings blackish-brown, lighter near the body and edged with yellowish-white. Expanse two and three-quarters inches. Not a rare insect in New England and the Middle and Western States.

Catocala patægama. Upper wings gray with black markings. Thorax gray. Body light brown. Lower wings orange crossed by two black bands. Expands two and one-half inches. I have specimens of this insect from Southern Ohio, but have never taken it in Massachusetts.

Catocala amica. Upper wings gray and black with a greenish shade. Thorax gray. Body yellowish-brown. Lower wings orange with a large brownish-black patch. Expanse of wings one and three-quarters inches. This insect is sometimes very common in autumn, and may frequently be taken in numbers on the trunks of poplar-trees. I have also found it abundantly when collecting other *Catocala* in oak forests.

Catocala antinympha. Upper wings blackish-brown, with black and brown marks. Thorax and body dark. Lower wings orange, with two black bands. Expanse, two inches. I have specimens of this insect from Ohio and Massachusetts.

Poaphila quadriflaris is a little moth which expands about an inch. It is very dark brown, or almost black, lighter toward the



Poaphila quadriflaris.

edges of the wings. The fore wings are crossed by two white stripes, the inner one being the narrower, while the lower wings are plain dark brown. This little insect inhabits marshy meadows and when disturbed flies so rapidly that it is difficult to follow it with the eye. Its flight is short, and it alights suddenly on a grass blade, keeping an eye on the intruder and holding itself ready for another flight. I have taken this moth rarely with a lighted lamp in Massachusetts.



Drasteria erectea.

Drasteria erectea is a very common insect frequenting open grassy fields and meadows. It flies rapidly when disturbed, but only for a short distance. This moth is one of the first to make its appearance in the spring, and may also be found abundantly in the late summer and autumn. In expanse about an inch and a half, it is one of the commonest visitors to the collector's lamp, sometimes becoming a great nuisance, fluttering about the lamp and even into the chimney, extinguishing the flame.

The larvæ of this moth feeds on clover and is of a reddish-brown color with darker stripes and two light gray lines on the back. The caterpillar might easily be mistaken for a Geometrid as it has but three pairs of abdominal legs and moves with a looping motion. The mature insect is grayish-brown with dark brown bands and markings disposed as shown in the illustration. The male is more



Catocala innubens.



Catocala flebilis.



Catocala desperata.



Catocala palaeogramma.

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strongly marked than the female. This insect is found over a large part of the American continent.



Euclidia cuspidea.

A pretty species related to the preceding is *Euclidia cuspidea*. Of the same size, its wings are brown crossed by bands of light yellowish and reddish-brown and having on the upper wings several patches of very dark velvety brown or black. This insect may occasionally be seen among low bushes and shrubs, particularly about patches of sweet fern. When disturbed it flies rapidly for a short distance and drops suddenly among the low bushes and conceals itself. The larva is unknown to me.



Rhodophora florida.

One of our most beautiful Noctuids is *Rhodophora florida*. Its expanse of wing is about an inch and a quarter. The fore wings are mottled with rich pink on a yellow ground for two-thirds of their length, the outer margin being yellow, while the lower wings are very light yellow or almost white. This insect may often be seen about the evening primrose, which is the food plant of the caterpillar, and it has the habit of concealing itself among the flower petals in the daytime, the tips of the wings alone being visible. This little moth has a wide range, and I have taken it in California, Nevada, Arkansas, Virginia, Ohio and in Massachusetts, and have specimens which were taken in Canada and Florida. The larva is probably a

nocturnal feeder, as it may be found hiding in the daytime among the young leaves of the primrose. It is greenish-yellow in color:

The cotton worm, *Aletia agillacea*, and the army worm, *Heliothrips unipuncta*, both belong to this group of insects, and are well known where they occur in numbers on account of their destructiveness.

The former lives on the leaves of the cotton plant, as its common name implies, and is the greatest enemy the cotton-growing industry has in the South. This caterpillar is nearly two inches long when fully grown, and is green in color with black stripes and black and yellow spots. The moth, which is very plain, expands an inch and a half, and is brownish-gray, the fore wings being crossed by faint wavy lines of a darker color. This insect is found mostly in the cotton-growing States, but has been taken in the North, where its occurrence is said to be from southern migration.

The army worm has a wider distribution than the cotton worm, being found over the whole of the eastern half of the country as well as in Europe and Australia. The moth is plain in color, being yellowish-gray and brown with a white dot in the centre of each fore wing. These caterpillars feed on grasses, and are sometimes so



Larva of *Heliothrips unipuncta*.

abundant as to devour almost every vegetable growth within their reach. At such times they commence their march for "pastures new," and are often seen in great numbers and all marching in one direction, which gives them their common name. The caterpillar is striped with dark gray or dark brown on a greenish-yellow or grayish-yellow ground, and is an inch and a half long when fully grown. The pupa state is passed in the ground.

A genus of *Noctuidæ* having many American representatives, among which are some very beautiful species, is *Plusia*. The fore wings rather pointed, usually of different shades of brown, are frequently ornamented with a silvery or golden comma-shaped spot (in some species several spots and patches), while the thorax and upper part of the abdomen is adorned with tufts of hair-like scales. The larvæ, generally greenish in color, sometimes striped, are some of them injurious to garden vegetables, and spin their thin cocoons, through which the pupæ can be seen, among the leaves.

These moths frequent flowers in the evening, one of their favorites being the phlox, upon the blossoms of which they alight. It is amusing to watch one of these moths standing almost upon its head



Plusia simplex.

as it thrusts its tongue into the flowers in its eagerness to procure the sweets. *Plusia simplex* is a common and well-known insect, expanding an inch and a quarter or more. The fore wings are brown, in some specimens pinkish-brown, darker near the centre, where there is a silvery spot whose shape can be seen in the illustration. The lower wings are dull yellow and margined with a broad band of brown. This insect is probably double-brooded, as I have taken it in June and again in September.



Plusia putnami.

A very pleasingly colored species is *Plusia putnami*. The head, forward part of the thorax, antennæ and legs are reddish-pink, the tuft of hairs on the thorax being pinkish-brown. The abdomen is yellow with tufts of pink hairs on the sides. The fore wings are reddish-brown, deeper toward the outer margins, and adorned with patches of silver and golden colored scales. The lower wings are yellowish with a grayish band near the margins, and edged with pink, the whole making one of our most beautiful little moths. I have never found this species common, but have taken it with a

lamp in Ohio and Massachusetts in August. Some species of *Plusia* have no metallic spots but are rich in their reddish-brown shadings.

In *Plusia cærea* the upper wings are purplish-brown. Head and forward part of thorax yellowish, dark gray above. Body yellowish-gray. Lower wings dark brown, lighter next to body. Expanse one and one-half inches.

Eucirrædia pampina has upper wings and thorax reddish-orange with brown markings. Lower wings and body pinkish-gray. Expanse of wings one and one-half inches. This is a common little moth in autumn, and is often taken while sugaring for *Catocala*.

In the species of the genus *Gortyna* the larvæ are stalk-borers, living in the stalks of both wild and cultivated plants, and sometimes doing considerable damage to the potato, tomato, Indian corn, etc., causing the plants to wither and die.



Gortyna nitela.

In *Gortyna nitela* the fore wings are purplish-gray stippled with yellow, a light line running across them. The lower wings are light brown. The larva is pinkish-brown, darker toward the head and is marked with light yellowish-white stripes. This species is frequently destructive to the dahlia and aster, passing its larval state within the stems of these plants and devouring their substance. The insect pupates just below the surface of the ground, where it constructs a slight cocoon. The moth appears in September.



Cucullia speyeri.

Cucullia speyeri is a gray moth with slender pointed upper wings marked with brown, the lower wings being white, margined with

gray-brown. This insect has a crest on the forward part of the thorax, and from this fact is called the hooded owlet. The caterpillar feeds on golden rod.



Pyrophila pyramidoides.

Pyrophila pyramidoides is a common moth with brown fore wings crossed by wavy lines of dark brown and black, while the hind wings are copper colored and brown. The whole upper surface of the insect is very glossy. In September this insect may be found on fences and tree-trunks and I have sometimes dislodged a number of them when stripping the loosened bark from dead tree-trunks in search of beetles. The food plants of the larva are the grape and Virginia creeper.

A very interesting species in the larval state is *Bellura gortynides*, which lives in the leaf stems of the pond lily, having a communication with the air through a hole in the leaf. When feeding it descends below the surface of the water to a distance, according to Comstock, of two feet or more. The perfect insect is brownish, and expands an inch and a half.



Mamestra picta.

A beautifully marked insect in the caterpillar state is *Mamestra picta* and the larva goes by the appropriate name of the zebra worm.

This insect is frequently to be seen in the autumn on the leaves of the parsnip, carrot and cabbage, although I have never seen it abundant enough to do much harm. The smooth, naked caterpillar is



Larva of *Mamestra picta*.

striped longitudinally with yellow and black in conspicuous bands, these stripes being crossed with numerous fine white lines on the sides of the insect. The larva burrows into the ground and passes the winter in the pupa state, whence it emerges in the spring a moth with dark chestnut-brown fore wings and yellowish-white hind wings. The moth expands an inch and a half.

In the genus *Agrotis* the larvæ are known by the appropriate name of cut-worms. The ravages of these pests are well known to farmers, gardeners and florists. What an aggravation it is after purchasing and carefully planting a few choice pansies or sowing and diligently caring for a bed of sweet peas to see the young plants toppling over and withering in the morning sun, their stems cut off just above the roots. The eggs of the moths are laid in the ground during July and August and the infant caterpillars soon make their appearance, but are so minute while their food (the roots of succulent plants) is so abundant that their depredations are not noticed. As cold weather advances they burrow deep into the ground, where they pass the winter in smooth oval cavities in the earth in a curled position. When warm weather again awakens them to life they work their way to the surface and are then most destructive to young plants, often cutting off in a single night numbers of cabbages, beans or peas, and hiding just below the surface of the ground during the daytime, ready to renew their depredations the next night. When the larvæ arrive at maturity they again descend into the ground, where they pupate. The moths emerge in July and August. The larvæ are stout-bodied creatures, dingy in color, often striped from head to tail with light gray and brown or black. They are naked, with a horny plate on the upper part of the body near the head, and the different species so closely resemble each other as to be scarcely distinguishable. These insects are very destructive to many flowering plants as well as garden vegetables, and one or two species have been known to ascend apple and pear trees and grape vines in

the night and devour the fruit buds, greatly diminishing their production.

Many experiments have been tried to destroy these pests, but perhaps the most effectual is to carefully remove the soil from about the infected young plants and kill the caterpillars as they lie curled up near the roots an inch or less below the surface of the ground. Small tin basins or cups placed in the ground near the plants in such a manner that their tops are on a level with the surface will be found to be excellent traps for these annoying marauders. The caterpillars in their nightly wanderings in search of food fall into the receptacles and one may wreak vengeance on them in the morning as they will be unable to climb up the smooth sides of the tin. Revenge is indeed sweet when one has seen his finest flowers and vegetables cut off in early youth by these destructive "worms." The perfect insects are mostly nocturnal in their habits, coming into our houses at night and secreting themselves behind picture frames or among clothing in our closets in the daytime. Some species are, however, day-flyers and may be seen during the sunny hours about the blossoms of the milkweed and golden-rod busily sipping their sweets.

Most of these moths are very dull in color, though a few are marked with pleasing tints of brown, gray and buff.

The following illustrations of a few typically marked species of *Agrotis* will give an idea of their general appearance.



Agrotis tassellata.



Agrotis c-nigram.



Agrotis normaniana.

Agrotis tassellata is a small moth. The color of its fore wings is dark gray with two light spots and two black spots on each. The lower wings are light brownish-gray, darker at their edges. This moth expands one inch and a quarter.

Agrotis c-nigram is a rather dark species, the fore wings being dark brown, gray and black, with a few lighter spots and markings, while the hind wings are light brown. It is one of the larger species, expanding an inch and three-quarters.

Agrotis normaniana is a prettily marked species, its fore wings being marked with gray, buff and black, with the hind wings buff and brown. The insect expands an inch and a half.



Agrotis herilis.



Agrotis venerabilis.

An exceedingly abundant species during August is *Agrotis herilis*. The fore wings are gray and black, with cream-colored marks and spots, while the hind wings are light brown. Expands about an inch and a half.

Agrotis venerabilis is a reddish-brown moth, whose hind wings are grayish-brown. Expands an inch and three-eighths.



Calocampa nuptera.

A rather rare moth, and at the same time a prettily marked insect, is *Calocampa nuptera*. This insect expands two inches and a half, and is marked as follows: the upper half of the fore wings is gray, darker toward the tips, light ash-gray nearest the body; an interrupted black line runs longitudinally through the middle of the wing, on which is situated a black spot; the lower half of the fore wing is chestnut-brown; the lower wings are reddish-brown, with a glossy surface; the thorax is dark brownish-purple and the abdomen reddish-brown. I have taken this insect occasionally in autumn while sugaring trees for *Catocala*. The larva of this moth is unknown to me.



Catocala antinymphea.



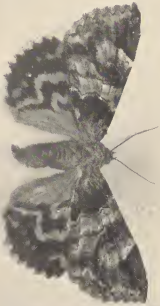
Catocala amica.



Apuleia lobeliae.



Eudroethia pampina.



Pardinus rubilis.

NOCTUID MOTHS.



Plusia arva.

Apatela americana is a gray moth, with a scalloped, light gray line near the outer margin of the fore wings edged externally with black and brown, and with a row of black dots along the outer



Apatela americana.

margin. The lower wings are yellowish-gray, and the insect expands two inches and a half. The hairy caterpillar feeds on the leaves of the maple, elm and chestnut, and is usually seen partially curled sidewise when not feeding. Its head, belly and legs are black, and its back is dull green. The hairs covering its body are yellow, with two pairs of tufts of long black hairs on the forward part of the body and a single tuft near the posterior extremity. In autumn the insect spins a cocoon composed externally of silk and hairs from its body, inside of which is another covering, composed of silk and bits of bark or chips of wood. This cocoon is usually hidden under the loosened bark of a tree and in it the pupa passes the winter.

In *Apatela lobelie* the upper wings are gray with light gray lines and black marks. Thorax gray. Abdomen brown. Lower wings light brown. Expanse two inches.



Gramatophora trisignata.

Gramatophora trisignata is a pretty species, being of a mouldy-green color on the fore wings, marked with lines and mottlings of black, with three round reddish-brown spots on each wing, the lower wings being light yellowish-brown.

This moth I have taken on one or two occasions with a lamp in Ohio and Massachusetts. I have also received one specimen from

Toronto, Ont. It expands an inch and a half. The larva is one of those strange, weird forms in which Nature seems occasionally to delight, suggesting that she must have been in a "wondrous merry mood" in evolving a being so grotesque. The extreme of the



Larva of *Gramatophora trisignata*.

fantastic and the ridiculous seems to have been reached in shaping this creature. Of beauty it has none, and is withal a most venomous looking animal, for when disturbed it swings its head from side to side in a menacing manner. The tuft of hairs just back of the head usually have attached the hard black shells of the insect's head which were shed in the earlier moults of the larva, and these add a good deal to its uncanny appearance, giving one the impression that it has several heads of different sizes. The caterpillar is dark brown, with a lighter brown patch occupying several of the segments. The six front legs, head and warts from which the hairs spring are shining black. The food plant of the caterpillar is lilac.

BOMBYCIDÆ.

Spinners.

The family of *Bombyx* is one of great importance, as it not only includes many of the largest and finest insects in the world, but also those of greatest importance to man from an economic standpoint, as in this family belong all the principal silk-producing insects from whose cocoons such a variety of beautiful and useful fabrics are manufactured. The moths belonging to this family are mostly stout, thick-bodied insects, frequently very hairy or woolly. They have small, sunken heads, and the antennæ are often feathered, particularly in the males. The mouth parts are either rudimentary or wholly wanting, many of the species not being able to appropriate food of any kind in the perfect state. Their wings are usually broad,

and in many of the species are covered with a dense armor of scales arranged in colored patterns, frequently very gay, while in others the clothing is of more subdued tints, soft and blended. The remarkable power by which the virgin females attract the males, often from long distances (referred to in a former chapter), is, to the best of my knowledge, confined exclusively to this family of moths.

The caterpillars are stout-bodied creatures, many of them densely clothed with hairs or spines, while others are fleshy and are adorned with rows of tubercles. A few are naked and smooth.

Xyleutes robinia. One may find in the trunks of poplar, oak and locust trees, protruding from large circular holes, the empty shells of this moth. *Xyleutes* (the carpenter) is a very appropriate name for this genus of moths, as their larvæ mine in the solid wood of



Xyleutes robinia. Female.

trees, excavating long tunnels, increasing in diameter as the caterpillars grow. Their larvæ have true legs and prolegs, but are grub-like looking creatures. The present species is flesh color above and light beneath, with the head and the forward part of the body above covered with a hard shelly substance, brown in color. When fully grown the caterpillars are two or three inches long. They seem to prefer large trees and sometimes do considerable damage, riddling the trunks and carrying their tunnels out through the bark before changing to pupæ. They are said to require three years to reach maturity and make their thin silken cocoons in the burrows some distance from the opening, usually lining the tunnel with silk both front and back of their cocoons.

The pupa is yellowish-brown, and, by means of rows of short spines on the abdominal segments, works its way to the mouth of its burrow, when the moth is about to break the shell. The moth comes forth in July, and is a night-flyer. The insect is very plain. Its wings are parchment-like, resembling in some respects the coddis flies. The female is light gray, with a net-work pattern of dark brown on the fore wings. The head and thorax are gray, and the abdomen and lower wings are brownish-gray. The insect expands three inches. The male is much smaller than the female. Its



Xyleutes robiniae. Male.

forward wings are of a greenish-gray and dark brown, its head and thorax gray, abdomen black, and its lower wings orange and black. Although not a rare insect, on account of its habits it is seldom seen.

Zeuzera pyrina. The leopard moth is a European species which has been introduced into this country. The wings are white, partly transparent, and marked with a number of dark spots and rings, from which it has derived its popular name. The caterpillar bores tunnels in the wood of various trees (elm, ash, maple, pear, apple, etc.), and is capable of doing a good deal of damage should it become very numerous. It is yellowish, with numerous black spots on the sides and back, and has a horny plate on the segment next the head. The moth may occasionally be taken about electric lights in the neighborhood where it has been introduced.

To the genus *Sthenopis* belong some rare and interesting moths. I have made the acquaintance of but two species of this genus in this country, *Sthenopis argentomaculatus* and *S. argentata*. These insects are much alike, the former being the larger, and measuring three and a half inches or more in expanse, while of the latter species, the only

specimen I ever took is two and a half inches across. Their colors are ashen gray, the fore wings being crossed by bands and rows of spots of darker gray. On the fore wings are two small silvery spots.



Sthenopsis argentata.

A remarkable characteristic of these moths is their exceedingly short antennæ. I have never seen the larva, and the life history of these moths is not known to me. Professor Comstock states that "the larva are nearly naked and grub-like in appearance, although furnished with sixteen legs. They feed upon wood and are found at the roots or within the stems of plants. They transform either in their burrows or in the case of those that feed outside of roots within loose cocoons." *S. argentomaculata* I have taken in northern Ohio, while collecting with a lamp. As it circled about the room, it looked, with its long wings, a good deal like a large dragon-fly. I also found a specimen of the same species in the same locality in the daytime clinging to the under side of a blackberry leaf. *S. argentata* (the species figured) I took at dusk in July in South Sudbury, Mass. It was flying slowly along the road in a wooded district, and I easily caught up with it and knocked it down with my hat. I have seen species of this genus from Mexico and Brazil; and a very large coarse-looking insect of the same genus was lately sent me from Cooktown, in Queensland, Australia.

The *Lasiocampians* include the tent caterpillars and the lappet caterpillars. The moths belonging to this group are downy or woolly and thick-bodied, and are distinguished by the lack of the loop and bristle which holds the upper and lower wings together during flight in other moths. The caterpillars are soft-bodied creatures, almost velvety to the touch, and are clothed with short soft hairs, thickest on the sides, which do not arise from warts or tubercles. The antennæ of these moths are feathered more broadly in the

males than in the females. When at rest the wings are folded in such a way that they slant both sides of the abdomen like a roof, and the lower wings project on the sides, not being wholly covered by the upper wings. The moths are night-flyers. Some of the larvæ are gregarious, living in colonies, frequently in immense numbers. Some species feed on cultivated trees, and on account of their vast numbers sometimes do immense damage. The pupa state is passed in a cocoon composed mostly of silken threads.

A numerous and most destructive species belonging to this group in the East is *Clisiocampa americana*, the tent caterpillar, whose unsightly webs of large dimensions are to be seen almost everywhere in neglected apple orchards and by the roadside on wild cherry-trees. The eggs of the female moth are deposited in a compact mass or bunch near the end of a twig, of its chosen food plant, partly or wholly encircling it. They are cylindrical in shape and are placed on end close together often three or four hundred in a bunch and covered with a shining brown water-proof varnish which protects them from the weather. In this state they remain during the fall and winter, and hatch about the time that the leaf-buds are ready to burst in May. The young caterpillars construct in the fork of a branch a small triangular web or tent of fine silken webs in which they remain through the night and during cold or stormy weather, sallying forth in long lines, usually in single file, each caterpillar spinning its web, presumably to enable it to retrace its steps as it advances to the ends of the twigs to feed upon the opening foliage. In time these lines of silk extend to the tips of all the immediate branches about the nest, which is added to as the individuals composing the colony grow in size. As they remain in this tent at all times when not engaged in feeding or in wandering to and from their feeding grounds, it is a veritable home, and in time becomes large and strong, capable of resisting the attacks of most birds and of all parasitic insects. When the caterpillars reach maturity they are about two inches long, sparsely clothed with soft hairs thicker on the sides, with black heads, and are striped lengthwise with white, yellow and black, with a blue spot in the middle of each segment on each side. When about to pupate they abandon their tent and separately wander off in search of a suitable locality in which to spin their cocoons.

These are spun in crevices in the bark of trees, about fences and stone walls, frequently on buildings on the clapboards or under the

eaves. They are oval in form, light colored and thin, and intermixed with the threads is a yellowish-white substance which seems to give stiffness to the cocoon. About two weeks after the cocoon is finished the moth makes its escape through a hole in one end which it moistens, it is said, with a secretion from its mouth, enabling the insect to push the loosened threads aside. The moth expands from an inch



Clisiocampa americana.

to an inch and a half or over, the male being smaller than the female. The body of the insect is woolly, and is of a rusty brown color, its fore wings being crossed by a lighter band edged on either side by a narrow grayish-yellow line. The male is somewhat darker than the female.

This insect in its caterpillar state is so injurious to apple orchards that its destruction becomes a necessity to keep the trees in bearing condition. It is not a difficult insect to combat, as its clusters of eggs are easily seen during the fall and winter, and can be picked off by hand and burned. When the young larvæ first begin their operations in the spring their nests may easily be taken from the trees and each colony destroyed in its infancy. To insure success in this work the tents should be removed either early in the morning or late in the afternoon, or else on stormy days when the whole colony is at home. A piece of coarse burlap wound around the end of a pole and saturated with kerosene oil will be found well fitted for the work, as the oil will destroy the caterpillars which it touches even if they are not removed with the tent. To keep one's orchard cleared of these pests the nests should be destroyed not only on the orchard trees but also on all neglected trees in the neighborhood infested by them, especially the wild cherry-tree, which seems to be the favorite food plant of the species. Two or three neglected trees will breed moths enough to stock several orchards with the pest the following spring.

The parasites probably do more to hold these insects in check than all other agents (man included) put together. If one will

closely watch a colony of the tent caterpillars when out of their nest or a large number of larvæ of any other kind, he may see a small swarm of ichneumon flies constantly hovering about and over them. These are on the watch for a chance to deposit their eggs in or on the bodies of the caterpillars ; and when one considers their numbers and persistency, one wonders that a sufficient number of the larvæ escape to propagate the species. Here is an instance which gives some idea of their ravages. One of my brothers had one hundred caterpillars of a large species he wished to raise which he placed on a young tree and enclosed the whole in mosquito netting. Under this net they remained until nearly full grown, when one day a small rent was discovered in one corner of the net presumably made by a bird ; and when the larvæ were taken out and examined, of the entire number but three had escaped the ichneuman flies which had found their way into the net and laid their eggs on the caterpillars.

While a species is comparatively scarce, its chances of escape from birds and parasitic insects are fairly good ; and if it is a prolific



Clisiocampa disstris.

species well adapted to its surroundings and has plenty of food, it will increase until its posterity may be reckoned by millions. It now begins to attract attention, both from the birds and the parasites, as a large amount of food going to waste. The parasites attack it, and having an abundance of food begin to increase at a rapid rate ; and the birds finding an easily obtained food-supply neglect other foods and apply themselves to this. The consequence is that the demand soon equals and finally exceeds the supply, and an entire region previously infested with an injurious insect may be so depopulated in one or two seasons that a careless observer might conclude that the species was extinct or had migrated to other parts. This, in my opinion, is the explanation of the sudden disappearance of many an

insect pest which may have at one time threatened the destruction of the plants upon which it subsisted.

The forest tent caterpillar, *Clisiocampa disstria*, resembles the preceding species both in its habits and in the general appearance of the caterpillar and moth. The larva is more bluish than the common tent caterpillar, has a row of spots along the back instead of lines, is greenish on the sides and has a blue head. It lives in large colonies of three or four hundred individuals on oaks and walnuts, and makes a large tent beneath which it remains except when feeding. This insect I have seen very abundant in the White Mountain region of New Hampshire, where it not only devoured the leaves of the oak and walnut, but also apple, cherry, and when hard pressed even birch, alder and elm. The insects were nearly full grown by the middle of June. The moth is about the same size as the preceding, but is of a more reddish-tan color, and the fore wings are crossed by a broad band of a darker shade. It is an inhabitant of all the New England and Middle States.



Tolyte vellea.

The lappet moth, *Tolyte vellea*, is a pretty and interesting species. The larva is very much flattened beneath, and along its sides are a number of flat projections or lappets from which spring numerous hairs making a fringe around the body. When the insect is not feeding it hugs closely to the bark of the tree, the hairs on its sides lie flat against its support; and as its colors are dull greenish-gray, it looks like nothing on earth so much as a swelling on the bark. One may even gaze directly upon it without realizing that it is anything alive. The larva is orange, sometimes red beneath and has an intensely black band between two of the segments on the upper side on the forward part of the body. This band does not show when the insect is at rest. It feeds upon the apple, poplar and willow, and reaches full size during July, when it is two inches or more in length. It spins a thick gray-brown cocoon, oval in shape, convex above, flat and very thin on the under side, and spreading out on the edges like

thin paper, attached to the trunk or a limb of the tree upon which the larva fed. The chrysalis is dark brown and very smooth. The moth makes its appearance early in September and is a night-flyer, occasionally attracted to lighted lamps. Its colors are soft and blended, being white shaded with blue-gray, and its wings crossed by two broad bands of dark gray. The female moth expands two and one-half inches, but the male is smaller, expanding but one and one-half inches.

Another species, closely related to the preceding but smaller, is *Tolyte laricis*, which lives on the larch. Its larva is brownish-gray in color and about an inch and a half long. Its habits are much like



Tolyte laricis.

T. velleda, and it makes a similar though smaller cocoon. The moth emerges early in September and lays its eggs, which do not hatch till the following spring. The female moth resembles *T. velleda* in color, except that it is lighter near the body, and the outer gray band on the forward wings is darker and narrower. The male, which is here figured, is dark gray with clouded wings. The abdomen is sooty black. According to my experience this is a rare moth.



Gastropacha americana.

Gastropacha americana is a reddish-brown moth with a lighter band crossing the wings, edged with wavy dark brown lines and having the edges of the wings scalloped. There is a good deal of discrepancy in size between the male and female, a good-sized specimen of the latter spreading two inches. The larva feeds on apple, birch, maple and ash. It is flattened beneath and fringed with hairs

on the sides, like *T. vellela*. It is gray above, with irregular white spots, and striped with sooty black, having two scarlet bands crossing the forward part of the body, on each of which are three black spots. The under side is orange.

The caterpillar measures over two inches in length when fully grown, and makes a gray-brown cocoon on the tree upon which it feeds. The moth emerges in June or early in July.

To the genus *Anisota* belong several pretty native insects. They are not large, the largest spreading less than three inches. The sexes differ so much in coloring, size and shape as to scarcely be recognized as the same species. The antennæ of the females are narrow, while in the males they are pectinated for two-thirds of their length. The larvæ feed on various forest trees and are sometimes so abundant as to completely strip the trees of their leaves. These insects pupate in the ground.



Anisota senatoria.

Anisota senatoria is a common species in the eastern United States and Canada, and may be taken the latter part of June about electric lights at night or found in the daytime clinging to grass-stalks under oak-trees, where they have rested to expand their wings after leaving the chrysalis shell. The female moth deposits her eggs in clusters on the under side of the leaves of oak-trees, and the larvæ may sometimes be seen in immense numbers.

They are apparently gregarious during their entire caterpillar state and in casting their skins they congregate on the ends of the twigs leaving their wrinkled cast-off coverings where they often remain after the larvæ are full grown and have departed. When young they eat only the small and tender leaves, devouring the

larger and tougher ones as they grow in size and strength, often stripping whole acres of forests of their leaves. When not feeding, the caterpillars congregate in immense clusters, bending down the smaller twigs with their weight. They are dark brown or black in color, with dark ochreous yellow stripes on their sides and back, and are armed with short spines on each segment, and two horns on the segment next the head. They are stiff, hard and rough when fully grown, and during the early part of September crawl down the trees and burrow five or six inches into the ground, where they remain in the pupa state during the winter. The chrysalis is hard and spiny; and when the moth is about to break the shell it works its way to the surface, where the empty case may be found protruding from the ground after the insect has flown. The female moth expands two and a half inches, and is of an ochreous yellow color, with a reddish cast, tinged slightly with purple along the outer margin of the fore wings. The upper wings are stippled with faint brown spots and have a small white dot near the centre. The male is much smaller than the female. Its wings look small in proportion to its body and are purplish-brown, darker toward the tips of the fore wings, which have a white spot in the centre.

Anisota stigma is not nearly so common an insect as the preceding species, and I have never seen it abundant. The habits of the caterpillar are similar to those of *A. senatoria*; but it is much lighter in color, being a tawny orange with dark stripes on its sides and back. Its spines are also longer. The female moth very much resembles *A. senatoria*, but is richer and more reddish in coloring, with larger spots of dark brown or black on its wings. The male is more like the female in color than is the male of the other species, and has a large white spot in the centre of the fore wings. The wings are also spotted with dark brown. This insect varies a good deal in the intensity of its coloring. Especially is this the case with the male, which is sometimes almost red. The male expands an inch and three-quarters and the female nearly three inches.

In *Anisota virginiensis* the scales are thinly scattered over the wings, so that they appear almost transparent. The female is more purple than the other two species, and lacks the sprinkle of brown spots. The male is small and purple-brown in color, with a scaleless, transparent patch in the middle of each of the wings. This insect I have never found abundant. The female moth is about the size of *A. senatoria*, but the male is smaller than the male of that species.

The larva of this insect, like the two preceding, lives on the oak. It is of a dull grayish-green color, with indistinct stripes of pinkish, and is stippled with white dots. It is armed with short spines and horns, and, like the other species of the genus, is rough and hard.



Anisota rubicunda.

Anisota rubicunda is very variable in its abundance or scarcity, and is sometimes to be taken in numbers where, during the next season, it may be rare. The species is usually very abundant in Washington, D. C., where the larva lives on the maple-trees, frequently doing much damage. The trees in the Smithsonian grounds are infested with the caterpillars, and the perfect insects just out of their chrysalids may be taken by the dozen in June clinging to the grass stalks under the trees. One may even gather the live chrysalides as



Chrysalis of *Anisota rubicunda*.

they protrude from their burrows and have the pleasure of watching the imprisoned moth emerge in one's own room. It is a beautiful insect. The fore wings are a delicate pink with a wide yellow band crossing them diagonally, while the lower wings are yellow with the lower margin pink. The body is yellow, and very soft and downy. The males are much smaller than their mates, and their coloring is usually much stronger. The insect spreads from one and a half to two and a half inches. The larva is two inches long, is light green striped longitudinally with dark green, and is horned in front, spiny along its back and sides, and is firm and rough to the touch. It

seems to be more plentiful in the South than the North, and is, I believe, a rare insect in New England.

We now come to the two genera *Citheronia* and *Eacles*, the royal moths, both represented by large species. They are very stout-bodied moths and hairy or woolly. The antennæ of the males are broadly pectinated for two-thirds of their length, the same organs of the females being simple. Their wings are strong, but they fly only by night. The larvæ are armed with horns on the forward part of their bodies and are also somewhat hairy. They spin no cocoons, but pass the winter in the pupa state under ground. The chrysalis is spiny on the abdominal segments, doubtless to enable it to push itself up to the surface when the moth is about to break the shell.



Citheronia regalis. Male.

Citheronia regalis is a large and strikingly marked insect, and is not rare in the South and West, where the caterpillar feeds on the leaves of the walnut, hickory, butternut and persimmon. The sexes frequently differ very much in size, although similarly marked. A good-sized male will measure four inches across its expanded wings, and a female six or more. I have a grand female specimen of this insect from Gainesville, Va., which is nearly seven inches across.

The body is reddish-orange, with yellow spots and lines on the thorax. The upper wings are olive streaked with broad reddish lines which follow the veins, and a number of large yellow spots are distributed over the wings as shown in the illustration. The lower wings are reddish-orange, with a few vague olive markings between the veins, a large spot and a defused band of yellow near the upper margin, which is usually covered with the upper wings. I have taken this fine moth about the electric lights in Washington, D. C., where it is not rare, have found specimens in Illinois and Arkansas, and have no doubt but that it inhabits all the Southern and Western States as far west as Kansas; but it must be considered a rare insect in northern New England.

An insect very closely allied to this I have seen in collections from Mexico, also from Colombia and Brazil, South America.

A friend living in Norwich, Conn., has succeeded in finding the larva of this moth there for several consecutive years, feeding on the leaves of the sumac, and has reared the perfect insects, of which he has sent me specimens.

The caterpillar is one of our largest, if not the very largest, being four or five inches in length, thick in proportion and very formidable in appearance, owing to a number of large curved spines with which it is armed on the forward part of the body. It is green in color, banded across the rings with blue. The head, legs, and large spines near the head are orange and the shorter spines black. Although a formidable-looking creature, it is perfectly harmless. When ready to pupate in September, the insect burrows into the ground, where it transforms into a stout brown chrysalis. This chrysalis works its way to the surface of the ground the latter part of the following June, and the fly emerging crawls to a neighboring bush, and there hangs suspended until its wings have developed and are rigid enough to support it in flight. It is a sluggish insect, and when found may be carried home on the twig to which it is attached without danger of its taking flight.

Eacles imperialis resembles the preceding, both in the larval and perfect state. Although not differing greatly in size, the males being slightly smaller than their mates, there is a marked difference in the coloring of the sexes. The ground color of both male and female is a rich yellowish-buff. In the male the forward wings are brownish-purple on the inner half, connected with a broad band of the same color extending along the outer margin. The lower wings

have an irregular wavy line of the same color crossing them with a round spot and a vague patch above. Both upper and lower wings, particularly the former, are stippled with blended spots of dark brown or black. The thorax and abdomen are mottled with yellowish-buff and brownish-purple. The female is lighter than her mate, all four wings being crossed with a band of brownish-purple, with an irregular clouded patch of the same color at the base of each wing near the body. The body is mottled and the wings stippled much the same as with the male. A good-sized specimen of this fine insect will measure five and a half inches across its expanded wings. It is not rare throughout the eastern half of the United States and Canada, and two or three closely allied species or varieties of the same species (one of them considerably larger than our own) occur throughout Mexico and temperate and tropical South America.

The eggs are deposited singly on the button-wood, oak, and the different species of pine, and the caterpillars may be found full grown in September. They are usually dark green in color, although occasionally brown or even black, three or four inches long when full grown, and are rather hairy. Each segment is armed with short rough spines, with four larger ones on the forward part of the body.



Larva of *Eacles imperialis*.

The spiracles are very distinctly marked on the sides. The larva burrows into the ground, where it transforms into a chrysalis, remaining in this state during the winter. The chrysalis, which is much like that of *C. regalis*, makes its way to the surface of the ground, where it emerges a moth in June, and the empty pupa case may be found partly protruding from its burrow after the moth has flown.

As the larva of this insect is a large and stout creature, it might be supposed that it would be readily seen; but as it is frequently located on the high branches of large trees and is usually of the same color as the leaves, it is not an easy insect to find. Where pine or sycamore trees overhang a road or a well-worn path the huge pellets



Male Moth.



Female Moth.

EACLES IMPERIALIS.

of excrement dropped by the caterpillar will enable one to search out its whereabouts. When found it is not an easy thing to dislodge him, as he has a tenacious grasp of the twig to which he clings. The moth is sluggish in its movements, but flies well when once on the wing, and may occasionally be taken about electric lights.

Saturnia io is a familiar insect to most persons having a slight acquaintance with our native lepidoptera, and like several other native insects belonging to this family of *Bombycidae* is a very lovely creature. The predominating color of the male, which expands three



Saturnia io. Female.

inches, is a yellowish-buff, deeper on the lower wings, the fore wings having a purple-brown spot a little above the centre of the wing, with two wavy lines near the outer margin, and one near the base of the wing, of the same color. In the middle of the lower wing is a large bluish spot with a white centre, having a broad ring of black encircling it. Outside of this is a sharp black line and then a reddish-purple line which broadens out into a wide band on the inner margin. The body is yellow, and the antennæ, which are red, are broad and pectinated. The female is considerably larger than the male. The upper wings are a deep brownish-purple crossed by darker bands edged with fine wavy lines of yellow. The lower wings are much like those of the male except that the bluish spot is larger in proportion and the colors generally darker. The thorax is purple-brown and the abdomen reddish-brown. The antennæ are narrow and slightly pectinated.

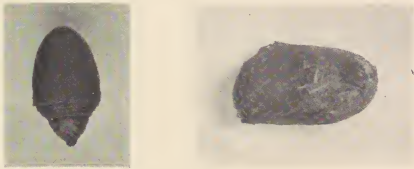
The eggs of the female are laid on the leaves of a variety of trees—oak, willow, locust, poplar, apple, etc.,—and are deposited in a

compact patch of from thirty to eighty, or more, on the under side of a leaf. When the caterpillars hatch they are reddish-brown in color and covered with minute spines. They are gregarious in their habits during the earlier part of their existence, feeding, resting and moving from place to place in regular order. When half-grown they separate, and during the remainder of the caterpillar state shift for themselves. The mature larva is two and a half inches long, of a



Larva of *Saturnia io*.

light green color, with a white stripe edged with reddish-purple extending along the sides. It is profusely covered with branching spines which are very sharp, and when carelessly touched sting like the nettle, causing the part affected to swell into whitish pimples, smarting painfully for an hour or two. When about to pupate the larva descends to the ground, where it draws together a few dead



Chrysalis and cocoon of *Saturnia io*.

leaves and spins among them a thin, irregular, brown cocoon, in which it passes the winter, coming out as a moth late the following June. This insect is readily attracted with a bright light, and the males may be assembled in numbers with a captive female.

Saturnia maia. When the leaves of the oak are unfolding in the spring colonies of small, dark brown, spiny larvæ may be found on them by diligent search. These are the young of the maia moth, and they may be easily reared by enclosing a small scrub-oak in mosquito netting and allowing the larvæ to feed. As the larvæ mature they

become solitary in their habits, and when fully grown are three inches long, and, like the preceding, are covered with sharp branching spines which sting, but in a less degree than *Saturnia io*, if the insect is handled carelessly. The larva is brown in color, with reddish-brown head and legs, the tubercles at the base of the spines being also reddish-brown. When about to pupate the caterpillar crawls to the ground and, drawing a collection of leaves and sticks together, spins a loose, thin cocoon among them.



Saturnia maia. Male.

The moth emerges late in the fall, usually about the middle of October, and is one of the last of our lepidoptera which the collector may take on the wing. The maia moth is a day-flier, and may be seen on mild autumn days when the woods and fields are brown, hovering over the shrubby oaks.

The males are easily assembled with a captive female. The sexes are readily distinguished from each other. The male has a broad feather-like antenna (while that of the female is narrow) and the end of the abdomen is adorned with a tuft of red hairs which the female does not have. The wings seem to be thinly covered with scales, and on that account are partly transparent.

This moth is often very local, and may be abundant in one locality while scarce in another, apparently as favorable to its habitation. It may be readily taken on the wing with the net, and when fresh and perfect is an exceedingly pretty insect, its colors of soft blackish-brown, creamy-white, and bright red harmonizing in a pleasing manner. The female may sometimes be found by watching the

movements of the males, who seem to scent them out, fluttering near the spot where the female rests concealed on a scrub-oak.

Next in order comes the group of moths called *Attaci*, which includes many of the largest silk-producing species.

Attacus cecropia is our largest native silk-spinning insect, and easily holds its place among the giant lepidoptera of the world. Specimens are occasionally taken six and one-half or even seven inches from tip to tip of their extended wings; and were it not so common, it would be much higher prized by collectors. When fresh from the cocoon, its wings (still soft, but fully expanded) have the appearance of being a part of some rich and heavy fabric, and a gentleman with whom I am acquainted having interests in a woollen mill, remarked, on seeing one of these grand moths for the first time, "Now if I could manufacture a piece of goods like that, I think it would sell." The subdued colors and the delicately traced patterns of many of the moths would, if imitated in fabrics, give greater variety and more artistic effects to the materials used for our adornment and comfort. The female cecropia moth, the bulk of whose enormous body is composed almost wholly of eggs (two or three hundred in number), lays them singly or at the most two or three together on the under side of the leaves of the food plant. These eggs are circular in shape, slightly flattened above and below, and

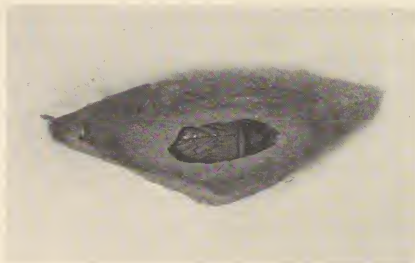


Larva of *Attacus cecropia*.

are creamy-white in color. The young caterpillars make their appearance in ten or twelve days and are at first dark brown or black, covered with minute tubercles and stout black spines. At each moult they change in color, and when three-quarters of an inch long are orange or deep yellow studded with black tubercles and spines. The insect assumes a greenish and finally a beautiful bluish-green color as it matures, eventually reaching a length of three or four inches and a thickness of one's thumb. It is then an imposing-look-

ing creature with large coral-red tubercles on the forward part of its body, yellow ones on its back, and smaller blue ones on its sides and about its head, all covered with short black bristles. It clasps the bough or twig on which it rests with a wonderful tenacity, and if placed on one's finger the grasp of its fleshy feet with their minute hooks is very noticeable. It has a peculiar odor, both in the larva and the moth state, which may be of some protection to the animal.

Toward the end of September the caterpillar constructs its coarse, brown, elongated cocoon, which is usually attached on one side to a twig or branch. This cocoon is composed of two parts, consisting of a loose, wrinkled outer covering and a well-shaped and dense inner pod, with fine floss silk separating the two, which are both loosely



Section of cocoon of *Attacus cecropia*.

open at one end to enable the moth to make its escape. There is frequently a marked difference between the cocoons found on trees and shrubs on high ground and those taken from low bushes and shrubs in swampy districts. The latter are frequently two or three times as large externally as the upland variety, and have a large amount of the floss silk between the outer and inner coverings. This variation I cannot explain, and have noticed no difference in the moths emerging from the two varieties of cocoons other than that the swamp-inhabiting specimens appear larger and richer in coloring than their upland relations. Sometimes the cocoons of these species are to be found in large numbers. In the suburbs of Chicago they may be seen on the shade trees in dozens and sometimes in hundreds; and I have known two men to collect a bushel of them in

this locality in half a day. The moth emerges about the 20th of June, usually in the morning; and by evening its wings are rigid and it is ready to take flight. As these moths take no nourishment their lives are very short after reaching maturity. Resting hidden

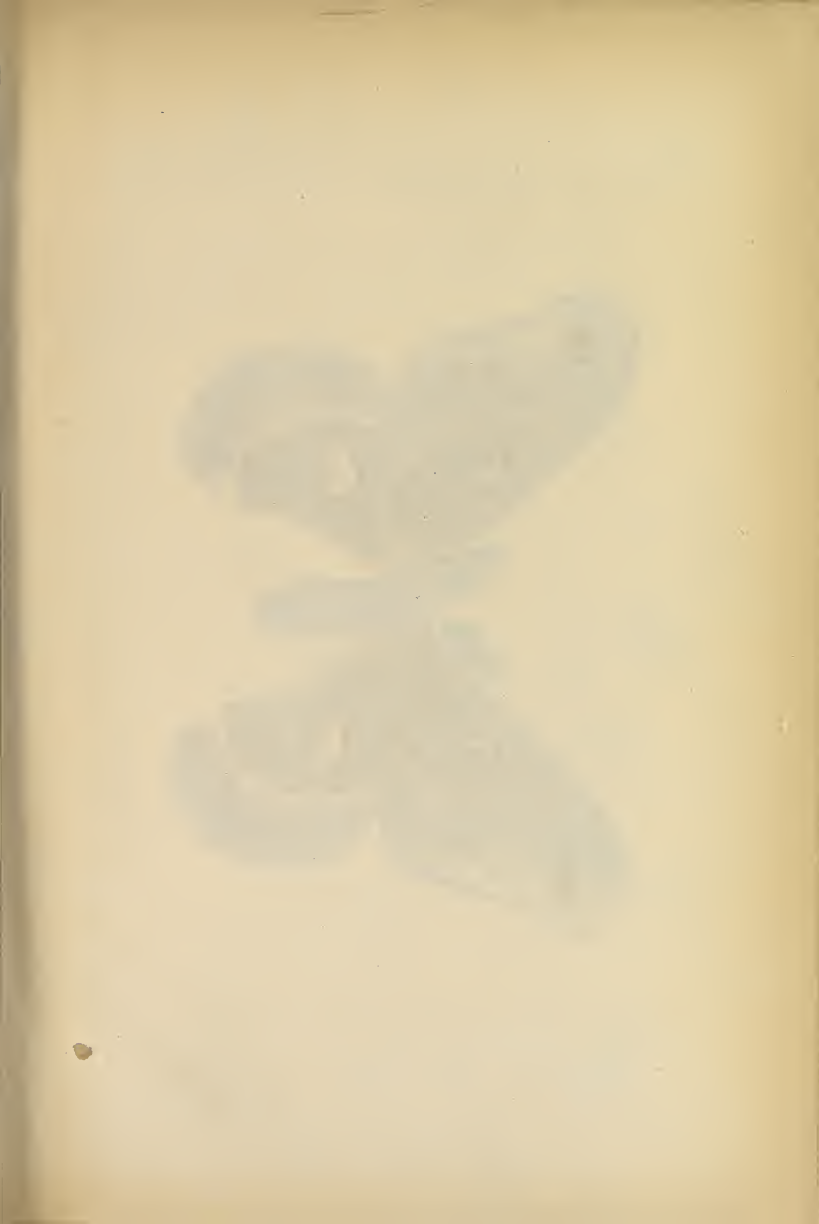


Swamp and upland forms of cocoons of *Attacus cecropia*.

by day among the leaves, the males sally forth at evening in search of their mates guided by their keen sense of smell, and having insured the continuance of the species for another year, they soon perish.

This insect inhabits a large part of the continent east of the Rocky Mountains. In Colorado, Utah, California and the far West generally its place is occupied by closely allied forms, very large and heavy-bodied insects, in which red and dark brown colors predominate. Two or three species of *Attacus* from Mexico are interesting, from having a transparent almond-shaped spot in the centre of each wing. One of these, *Attacus splendens*, is a lovely creature, on whose wings pink, brown, purple, black and white are mingled, making a very pleasing combination. There is frequently great variation in the coloring of these moths.

Attacus cynthia is a species which has been introduced into this country and Europe from China, and may now be found in a wild







UPPER SIDE

ATTACUS CECROPIA



Under Side

ATTACUS CYNTHIA



UPPER SIDE



UNDER SIDE

ATTACUS PROMETHIA — MALE





UPPER SIDE



UNDER SIDE

ATTACUS PROMETHIA — FEMALE

state in the vicinity of New York City, Philadelphia and other places where its food plant, the alanthus, has been cultivated as a shade tree. It became so common in Philadelphia and Washington, D. C., at one time as to be a pest, and threatened the destruction of the trees; but the parasites and birds seem now able to cope with it and hold it in check.

This insect is reared in Asiatic countries for its silk, which is said to be strong and very durable, but lacks the beauty of that produced by *Bombyx mori*. It was probably for its silk that it was introduced into this country, but that it has ever been successfully utilized here for the manufacture of fabrics I have yet to learn. The female lays two hundred to three hundred cream-colored eggs, and the young caterpillars are yellowish profusely adorned with black spots and tubercles. The mature caterpillar is three inches long, of a clear bluish-green color adorned with blue tubercles. The cocoon is similar in shape to that produced by the next species described, *Attacus promethia*, and is a little larger.

In some parts of the country the insect is double-brooded, the second brood remaining in its cocoons during the winter months, coming out late in June. The moth is a fine large insect, expanding, in large specimens, four or five inches. The females are usually a good deal larger, with broader wings than their mates.

Attacus promethia is a very abundant species throughout a large part of the United States and Canada, and is one of the first of the family with whose life history the amateur collector is likely to become acquainted. The female moth deposits her eggs in July on the twigs of the wild cherry, sassafras and button-bush, sometimes five or six together and at others twenty or thirty or more in a



Larva of *Attacus promethia*.

cluster; and toward the end of that month the minute caterpillars make their way out and mount to the top of the tree or bush, where they may be found feeding on the tender young leaves. When fully grown the caterpillar is one of the handsomest, being two inches long, half an inch thick, very smooth and plump, and of a light bluish-green color. There are four cylindrical coral-red tubercles on

the upper part of the body just back of the head and a large yellow one near the tail end. Numerous small blue warts occur in regular order on the back and sides. The head, legs and posterior part of the body are yellow. While feeding these caterpillars usually remain among the tender leaves on the new growth, and several are generally found in close proximity. On reaching maturity the caterpillar descends to the lower part of the bush and begins spinning its cocoon. After selecting a leaf suitable for its purpose, it commences by spinning a quantity of silk along the branch and down the stem of the leaf in order to make it secure for the winter.



Cocoon of *Attacus promethia*.

It then draws the sides of the leaf together with silk, and therein spins its tough, brownish cocoon. The silk is very strong, and the cocoons are attached so firmly to the twigs by their slender cord that they ride secure for the winter. In fact, one may often find cocoons which have weathered the blasts of several seasons still firmly attached. The upper end of the cocoon, which is double like *Attacus cecropia*, is so loosely spun that the moth has little difficulty in forcing its way out. This silk could probably be made useful in the arts, as it is very strong and durable and the caterpillars could be reared in the open air in countless thousands with little difficulty.

The moths emerge from the cocoons the latter part of June and the first of July, the females differing so much from the males as easily to be mistaken for different species. The male is a very oily



Male Moth.



Female Moth.

ATTACUS ANGULIFERA.

insect, and in preparing specimens for the cabinet the abdomen should be opened from the under side and its contents removed, the space being filled with cotton. *Attacus promethia* is a day-flyer; but although such a common insect, it is seldom seen on the wing unless one is assembling the males with a captive female. When following up the scent, the insects do not seem to know fear, and one may gather by hand the specimens hovering about a captive female, almost as readily as he may pick roses in a garden.

One of my brothers had an amusing experience on one of his collecting tours through the country where he carried a live female, *Attacus promethia*, fastened in a net to the frame of his bicycle. In wheeling along the road he could watch the train of eager suitors as they followed his tracks, crossing where he crossed and stopping and circling about where he stopped. Coming to a farmhouse, he went in for a drink of water leaning his wheel against a tree. As the good lady brought out the drink of water he innocently asked her if she ever saw any butterflies in that neighborhood. "No," said she, "they are pretty scarce about here; I don't know when I have seen one." By this time the train of moths began to arrive and flutter about the lawn. "Why," said the old lady, "there is one now, a big one; and there is another and another. I haven't seen so many butterflies before this summer. Why look at them. Did you ever see the like? I never saw so many butterflies before in all my life." Having thanked her for the water, my brother mounted his wheel and rode away, followed by the flock of "butterflies," leaving the old lady standing on the lawn and looking after him in open-mouthed wonder.

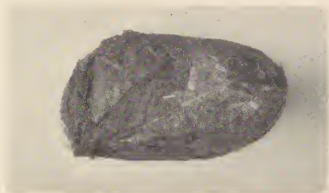
Attacus angulifera is a moth closely related to the preceding. It is a rare insect in the Northern and Eastern States, but is plentiful in some parts of the South, where the larva feeds on the leaves of the buttonwood. The cocoons spun by this caterpillar, which closely resembles *A. promethia*, also resemble those of that insect, and are attached to the stems in the same manner. They are, however, larger and less firm. The moths hatch in June, and are day-flying insects. The female is a rich tan color, with a black wavy line extending across all the wings and the eye-spot near the tip of the fore wing, similar to *A. promethia*. The male somewhat resembles the female of *A. promethia* in the color pattern of its wings, but is of a dark yellowish and ochreous-yellow stippled with dark brown or black.

The large and fine moth, *Telea polyphemus*, is a native of the eastern half of the United States, and is a familiar object to every one who has made a collection of native lepidoptera. The eggs of the moth, two or three hundred in number, are usually laid singly on the leaves of a variety of trees, oak being its favorite food plant, while maple, elm, birch, cherry, linden and other trees frequently furnish its fleshy light green larva with sustenance. The larva may easily be distinguished from the larva of *Actias luna*, which it closely resembles, by the seven oblique yellow lines on each side of its abdominal segments, while the larva of *A. luna* has a lateral yellow stripe. It is a large and handsome caterpillar, when fully grown



Larva of *Telea polyphemus*.

measuring three or four inches in length and thicker than one's thumb, while each of the segments is adorned with pearl-colored tubercles from which spring silvery hairs. The caterpillar spins its whitish oval cocoon in September, and passes the winter in the pupa



Cocoon of *Telea polyphemus*.

state. The cocoon is usually spun among the leaves still on the tree, and generally falls to the ground with the leaves. The silk is strong, nearly white and of a silvery lustre, and as it is spun in a continuous thread, it may with care be unwound after soaking in warm water in which has been dissolved a little baking soda. This

silk has been used for manufacturing into fabrics, and although it has not the fineness of the silk of *Bombyx mori*, it is exceedingly durable and beautiful, and a garment made from it would probably last a life-time.

Many experiments have been tried from time to time with the view of making this insect of commercial value as a silk producer, but thus far, I believe, without success. The greatest difficulty seems to be to unwind the silk from the cocoons rapidly enough and in a sufficiently large quantity to make the operation financially successful. It seems as if here was a fair field for the inventor. What clothing we might have if the silk from the cocoon of *Telea polyphemus* could be unwound, spun and woven into cloth inexpensively. Just think of the undergarments, socks, gloves, etc., we might wear, not to mention the curtains, portières, rugs and carpets that might adorn and bring comfort to our homes. I believe this will be achieved at no distant day. As the food plants of this insect abound almost everywhere where there are forests, the food supply is unlimited. The caterpillars are hardy and could be reared out of doors in innumerable millions with the simplest contrivances; and with simple and efficient methods of manufacture, silk goods should be as cheap as cotton.

It is interesting to watch one of these large caterpillars spin its cocoon. The spinneret is located just below the jaws, and as he moves his head backward and forward the silken thread is drawn out. It takes about three days continuous labor to complete the cocoon, and when it is nearly finished the caterpillar gives the whole interior a coating of waterproof varnish, which when dry makes the cocoon feel hard and firm.

When the moth is about to emerge, a liquid is discharged from a gland located where the mouth should be, if it had one, which dissolves the substance which binds the threads together, when they are pushed aside and the insect escapes from a large round hole in the end of the cocoon.

There is considerable variation in the color of the moths. Some are yellowish, some buff, while others have a decided reddish or pinkish tint. These latter are frequently very large and beautiful specimens. *Telea polyphemus* is a night-flyer and on this account although a common insect is rarely seen unless one knows just where and when to look for it. The males are easily assembled with a caged female, and when the cocoons are hatching in one's attic the males

outside will sometimes keep up such a fluttering against the windows of the house in their mad desire to get in, that sleep is out of the question.

The surpassingly beautiful *Actias luna*, with its translucent pea-green wings bordered with purple, is justly esteemed by collectors as one of the most lovely creatures the insect world affords. When fresh from the cocoon, its downy wings fully expanded and perfect in every detail, it is a delightful creature to look upon, and is familiar to most persons who have lived any time in the country, the long tails of its hind wings and green color making it easily distinguished from any other insect known to the United States or Canada. The moths emerge from their cocoons in June, and may frequently be seen on moonlight nights flying among the upper branches of the forest trees. Being very light they look almost white in the moonlight. They are difficult to catch on the wing unless one has a female with which to assemble them, as they fly so high. They usually rest quietly among the foliage in the daytime, and on account of their protective coloring are difficult to find.

The eggs of the moth are laid singly on the leaves of the walnut, hickory, birch, chestnut and other forest trees about the middle of June, and the caterpillars soon hatch. They are dark in color at this stage and covered with hairs. They reach their full size early in September, and are then two and a half to three inches long, as thick as one's thumb, and of a translucent green with a yellow stripe extending along each side, a similarly colored band running transversely across the back between each of the segments and miniature pearl-colored tubercles along the back and sides, which bear many short, light yellow hairs. This larva closely resembles the *Telea polyphemus* larva in shape and size, but the latter has larger tubercles, the segments are more humped, and it lacks the continuous yellow stripe on the sides. The larvæ spin their thin, brownish cocoons among the leaves, still fresh and green, and when they fall, the cocoons fall with them and are covered up on the ground by other leaves and by the snow, which protects them from the severe frosts of winter. Many of them are found by the moles, skunks, crows and jays and help eke out the scanty rations of these animals during the months of scarcity. One may find the cocoons in autumn and early spring by searching among the fallen leaves under the walnut and birch trees. This insect is not very hardy, but may be reared with care from the egg or the caterpillar, although the moths





UNDER SIDE

TELEA POLYPHEMUS



Upper Side

TELEA POLYPHEMUS



ACTIAS LUNA.

Male.

are apt to be small in size, as the insect does not seem to thrive well in captivity.

I am in hopes of finding a method of breeding luna moths of good size, but so far the efforts of my brothers and self have resulted in pigmies. This insect is sometimes found in great abundance, and I have seen the sidewalk under an electric lamp littered with their wings, the insects attracted to the light having probably been devoured by bats.

Cabinet specimens should be kept out of the light, or they will soon lose their beauty. A good-sized insect of this species will expand five inches. The females are generally of a bluish-green, while the males are more yellowish. The broad band along the upper margin of each fore wing, extending across the thorax, is purplish-brown. On each wing is a transparent eye-like spot surrounded by rings of maroon, ochre-yellow and black. The body is very downy and cottony-white, and the antennæ are ochre-yellow. The insect has a wide range over a large part of the country. Allied species are found in Central America and in Japan and China.

The silkworm par excellence (*Bombyx mori*), domesticated in China at a very early date, was long ago introduced into Europe and later into America, where it is still cultivated to a limited extent. The rearing of the larvæ and reeling of the silk of this species has not met with the success predicted for silk culture in this country; and although the government took up the problem in a scientific manner at their experimental station in the Agricultural Department in Washington, D. C., after a great many attempts covering several years, the enterprise was finally abandoned. One great obstacle in connection with the successful rearing of this insect in large numbers is the fact that it thrives well only on the mulberry tree (its native food plant) and the osage orange, necessitating the cultivation of these trees over large areas. It is also much less hardy than the larvæ of most of our silk-spinning moths. The insects, too, are very susceptible to several contagious diseases which sometimes carry off hundreds of thousands in a single night.

The female moth lays three hundred or more eggs, which are round and of a light yellow color, and are usually attached to the paper generally provided for this purpose by a secretion furnished by the moth. The eggs soon begin to turn dark, and the young caterpillar when it makes its escape is dark gray, clothed with long hairs

which spring from tubercles on its sides and back. With each moult the caterpillar grows lighter, and when fully grown is two inches long, dull yellowish in color, with a curved horn somewhat resembling that of the larva of a sphinx moth on the posterior end, and the first three segments next the head very much swollen and wrinkled. The interior of the body is filled largely with the silk glands, extending one on either side in a loosely-wrinkled tube. These are the glands from which, after the larva is steeped in vinegar, the silk gut so useful to the angler is manufactured. The cocoons are often very beautiful and symmetrical, usually oval, but sometimes constricted slightly about the middle. They are ordinarily light yellow, though sometimes silvery white, greenish or flesh color.

The moths emerge in about three weeks. They are cream colored with two indistinct lines across the fore wings, and as they expand only a little over an inch, are small in proportion to the size of the larva and the cocoon. Neither male nor female is able to fly, and after leaving the cocoons they pair, the females lay their eggs and soon die.

This insect has been so long under cultivation that several varieties have been produced which, if found in a wild state, would be considered distinct species. The original wild stock is not known, but may yet be found in some of the little-known interior districts of China or India.

An insect which is fast becoming well known through the United States and Canada through the efforts of the Massachusetts legislature in distributing profusely illustrated literature on the subject, is the Gypsy moth, *Oeneria* or *Porthetria dispar*, an importation from Europe. The larva of this moth, to which little in the way of vegetation seems to come amiss, is a most destructive pest, and, but for the efforts of the state, which has appropriated large sums of money for its extermination, the insect would doubtless ere this have spread over the whole of the eastern half of Massachusetts. At present it is confined to a limited extent of country within Middlesex County, and it is hoped that by persistent effort it may be entirely eradicated. The insect is attacked at every stage of its development. About the trunks of trees in infected districts bands of burlap are secured, and under these the larvæ are often found resting during the day, they being night-feeders. The pupæ concealed about stone walls, on fences and tree-trunks and like places, frequently in immense numbers, are destroyed when found. The egg clusters are



MALE



FEMALE

OCNERIA DISPAR

gathered and burned or treated with a solution which destroys their life. Whole areas of forest and scrub land have been cleared and burned over to annihilate the pest. The work of the Board for the extermination of this pest has met with a good deal of adverse criticism, but that its labor of keeping in check this foreign army of invasion has been thoroughly performed, is shown by the fact that in many places where most abundant a few years ago it is now a very scarce insect. In fact one may walk for miles through parts of the infested area and not see a sign of its presence.

The male moth is much smaller than his mate and can fly, while the female, although provided with wings, cannot use them in flight. The distribution of the insect, therefore, even if unrestricted, would be slow. The eggs are laid in clusters, usually on the bark of a tree, although the moth does not seem to be particular in this respect. The clusters are covered with hairs from the abdomen of the female and being ochre yellow in color are readily seen. The larva is brown and is thickly covered with stiff hairs, while red and blue tubercles adorn its back.



Porthesia chrysorrhæa.

Another importation from Europe which has also found a foothold in eastern Massachusetts, although not nearly so destructive as the Gypsy moth, is the Brown-tail moth, *Porthesia chrysorrhæa*. The moth is creamy white, with a white body tipped at the end of the abdomen with a tuft of brown hairs, from which the insect derives its common name. The larva is dark brown or black, with reddish hairs covering the body except on the sides, where there is a row of small tubercles from which spring white hairs. There are several small scarlet warts on the back. This insect is a good deal of a pest where abundant, as it devours the leaves of several of our fruit and shade trees and measures may have to be taken to prevent its increase and spread.

A number of the following stout-bodied, hairy moths belong to the family *Natodonta*. Some of them resemble the Noctuids, both in the pupa and perfect state, and may easily be mistaken for them. The larvæ, which often bear humps, tubercles and spines in many of the species, have but four pairs of abdominal legs used in crawling, the last pair being prolonged into tails or are held above the supporting twigs while at rest. Some of the larvæ are naked and others sparingly clothed with soft hairs. They feed on the leaves of trees and shrubs, often in great numbers, and their transformation usually takes place beneath the ground.



Cerura borealis.

Cerura borealis is a whitish moth, marked with brown bands across the upper wings, and is interesting from its peculiarly shaped



Larva of *Cerura borealis*.

larva, which has a forked prolongation or tail adapted from the last pair of abdominal legs. When disturbed it pushes out from the end of this forked tail two fleshy orange-colored filaments, which it bends over its back or sides as if to protect itself. This larva is naked, is green and purplish in color, and feeds on the poplar and choke-cherry; its color is protective, and it looks while feeding on a leaf a dried and withered part of it.

Clusters of a smooth, bluish, yellow and black-striped larva, with the head and a hump on the posterior end of the body, orange-red,

may often be seen hanging to the stems and leaves of the oak in September. This is the larva of *Edema albifrons* and is sometimes



Larva of *Edema albifrons*.

abundant enough to do considerable damage to the trees. When not feeding, and especially if disturbed, the caterpillars bend the head



Edema albifrons.

and rear end of the body over the back. The perfect insect has brown upper wings with a whitish band along the upper margin, and light yellowish-brown lower wings.



Caelodasys unicornis.



Caelodasys biguttata.

A curiously humped caterpillar is the larva of *Caelodasys*, of which we have several species. *Caelodasys unicornis* is buff-gray,



Larva of *Caelodasys*.

with darker markings, and *Caelodasys biguttata* is gray with brown markings and light brown hind wings.

A closely related species is *Nerice bidentata*, a little moth which is rather rare. The upper half of the upper wings is brown with an uneven dark brown line running from base to margin. Below this is



Nerice bidentata.

a white area gradually shading into light brown. The lower wings are light brown.

Another curiously humped caterpillar is the larva of *Edemasia concinna*. The head and a hump on its back is red, while the body



Larva of *Edemasia concinna*.

is striped with black, yellow and white lines and supports a few black spines. This caterpillar is sometimes to be seen in clusters on



Pheosia rimosa.

the apple-trees, where, if unmolested, it is capable of stripping the branches bare of leaves. It also feeds on the cherry and plum. The

cocoon is made under leaves in August or September, and the perfect insect comes forth in June or July of the following year. The moth is light brown and gray and has a dark brown band along the lower margin of the upper wings. It expands something over an inch.

Pheosia rimosa is a gray, brown and yellowish-white moth occasionally to be seen about electric lights. It looks and flies a good deal like a noctuid.

A moth which curls its abdomen up in a curious manner when at rest is *Apatelodes torrefacta*. In this position it would scarcely be



Apatelodes torrefacta.

taken for a moth at all unless closely examined. The fore wings are gray, with a dark brown spot near the base. The lower wings are light pinkish-brown. Both sets of wings have faint lines crossing them.

Great numbers of a black and yellow-striped larva sparingly furnished with soft whitish hairs may be seen in August and September on the apple and cherry, and also the birch and other forest trees, completely stripping the branches of their leaves. So numerous are they and sometimes congregated in such masses that the branches bend with their weight. These caterpillars bend the head and tail



Larva of *Datana*.

up over the body when disturbed and rest on the four forward pairs of abdominal legs. They are the larvæ of *Datana*. The caterpillars

descend a few inches into the ground in the autumn, where they remain in a chrysalis state till the following July. Our best-known



Datana ministra.

species is *Datana ministra*, a tan-colored moth with buff lower wings and having a patch of reddish-brown on the thorax and several lines of the same color crossing the fore wings.

A genus of moths of medium size, interesting from their gay colors and the habits and shapes of the larvæ, is *Limacodes*. These larvæ are slug-like creatures, and would hardly be taken for caterpillars at all by the novice. The body is short and thick, high in the middle and flat beneath. The head is concealed beneath the forward part of the body, and both the true legs and prolegs are



Limacodes scapha.

scarcely discernible. The animal adhering closely to the leaf or twig upon which it rests has much of the gliding motion of the slugs. Some of these larvæ are naked, while others are adorned with branching spines or fleshy filaments. Some of the caterpillars

are gayly colored. When mature they spin a tough oval or nearly spherical cocoon attached to the twigs of the food plant, oak, walnut, birch and other forest trees furnishing them with food. The moth emerges from the cocoon by pushing off one end, leaving the side attached like a half-spherical lid.

Limacodes scapha is a prettily marked little moth expanding about an inch. The body and lower wings being cinnamon-brown, and the upper wings having a rich reddish-brown patch covering most of the upper part of the wing, edged with silver beneath. The rest of the wing is light brown. The larva is green, without spines, short, thick and high in the middle. It feeds on the oak.



Limacodes querceta.

Another prettily marked insect is *Limacodes querceta*. It is reddish-brown with a small dot of dark brown in each fore wing, and a broad, irregular patch of light green extending from near the lower margin next the body diagonally across the wings to near the tip.



Parasa fraterna.

The caterpillar lives on the oak and willow, is yellow and purple in color, and has a number of branching, pointed filaments which spring from its back and sides. The moth makes its appearance in July, and often comes into our rooms at night attracted by the light. It is a rapid flyer for so small a moth, its short wings humming with the rapidity of their motion.

Parasa fraterna is a rare and beautiful little moth, and is closely related to *Limacodes*. The upper wings have a wide, bright-green band crossing them, with a brown margin and a brown patch next the body. The abdomen and lower wings are light yellowish-brown, and the thorax is green. I have taken this insect on but two or three occasions with a lighted lamp in Massachusetts, and know nothing of its life history.



Lagoa crispata.

To the genus *Lagoa* belong some very woolly moths which go by the appropriate name of flannel moths. Our common species, *Lagoa crispata*, is of a light yellow or light buff with crinkled black and



Case of the Evergreen Bag Worm.

light brown hairs on the fore wings. The body is very downy, and when at rest with the wings folded the creature looks like a bit of wool. The larva, which is also very woolly, feeds on the blackberry, oak and apple. The head is hidden beneath the forward segments of

the body and the legs are so short as to suggest the larva of the *Limacodes*. The cocoon is formed of the hairs of the caterpillar closely woven with silk.

In *Thyridopteryx ephemeraformis* or the evergreen bag worm, the larva constructs a bag or case of silk and pieces of the leaves of its food plant, which it carries from place to place as it feeds, and in which it resides during its caterpillar state. The larva lives on the red cedar and the arbor-vitæ, and the pieces of the leaves are laid lengthwise of its case or bag. The female moth is wingless and grub-like, and never leaves the case, in which it transforms into a pupa after having closed up both ends with silk. The male is provided with wings which support it in flight. Its body is long and tapering and its antennæ are pectinated. Several species of this genus are natives of this country.



Halisidota caryæ.

An insect sometimes very common and doing considerable damage in the Eastern States to hickory, elm, beach, apple and other trees is the hickory-tussock moth, *Halisidota caryæ*. The larva is a pretty caterpillar, an inch and a half long when mature in September. The head, feet and belly are black, and the body is covered with spreading tufts of hairs, white on the sides, with a crest of black tufts along the middle of the back, and long white hairs growing forward over the head. There are also two pairs of tufts of long black hairs placed near either end of the body with a single pair of white tufts near the posterior end. The larva makes an oval gray cocoon composed largely of its own hairs held together with silken threads. This is usually hidden away beneath stones, in the chinks of bark, etc. The moth makes its appearance in June. Its wings are ochre

yellow and seem to be thinly covered with scales, rendering them semi-transparent. Several rows of whitish, silvery spots cross the fore wings and between them is a fine stipple of brown dots. We



Halisidota tessellata.

have other species of tussock moths which closely resemble the foregoing, both in the larval and perfect state.

Orgyia leucostigma is interesting from the fact that the female is a wingless, grub-like creature, looking little like her mate which, although plain grayish-brown in color, has broad wings and can fly.



Larva of *Orgyia leucostigma*.

The caterpillar is one of our handsomest, being striped with yellow, brown, green and lilac, sparsely clothed with white hairs on the sides with two long plumes of brown hairs next the head, a similar plume on the posterior end of the body and four short, thick, white puffs on the back. Its head is red, and there are two red warts near the tail. The insect feeds on apple, sometimes doing a good deal of damage, spins a thin cocoon frequently on the tree trunk, and upon emerging, the female lays her eggs on the top of the cocoon, cover-

ing them with a frothy substance which, on drying, makes a white crust.



Leucaretia acraea.

Sometimes seen in numbers in June is the salt-marsh moth, *Leucaretia acraea*. The thorax, the end of the abdomen and the upper wings of the male moth are white, while the abdomen and the lower wings are yellowish-tan color. Both sets of wings are sprinkled with black dots, and the abdomen has two rows of small dots on each side and a row of large black spots on the back. The female moth differs in color from the male in that the lower wings are white instead of tan. The larva of this moth, which is widely distributed, is frequently seen in large numbers feeding on the coarse lowland grass, not only of the sea-coast, but in the interior of the country. It will also attack other plants, and is capable of doing a great deal of damage. When full grown it is nearly two inches long, covered



Phragmatobia rubricosa.

with long dark brown hairs on the back and lighter hairs on the sides. The spiracles along the sides are white, and the skin of the caterpillar is yellowish. In the fall the caterpillar conceals itself

among the lower grass stems or under stones, and there makes its hairy brown cocoon, in which it passes the winter in a chrysalis state.

A pleasingly-tinted little moth is *Phragmatobia rubricosa*. The upper wings and thorax are pinkish-brown, the lower wings reddish-pink with brown margins, and the abdomen is red with a row of small brown dots on either side, with another row down the back. The wings are so thinly clothed with scales as to be almost transparent. The larva is unknown to me.

An insect well known to almost every one is the brown and black hairy caterpillar covered with stiff short bristles all about the



Larva of *Pyrrharetia isabella*.

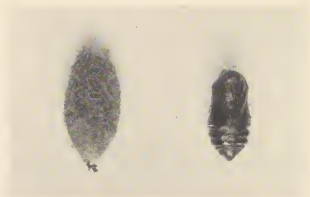
same length, which rolls itself into a round ball when disturbed. This creature feeds on a variety of herbaceous plants, and may be seen in the fall actively engaged in seeking a suitable place for its winter hibernation; for, unlike the larvæ of most lepidopterous insects, it passes the winter in the caterpillar state and may sometimes be found on mild days in the winter crawling over the snow.



Pyrrharetia isabella.

As soon as vegetation starts in the spring it begins feeding, and makes its hairy cocoon under boards, stones and the like in April or May, whence it emerges a moth in June or July. This moth is *Pyrrharetia isabella*, and is of a tawny yellow or dull tan color, having a number of brownish spots on its wings and body.

The *Arctians* are a genus of moths represented in this country by several exceedingly beautiful forms. The species are very variable, and on this account have caused considerable confusion. The antennæ are usually feathered in the males and simple in the females. The larva is covered with stiff sharp-pointed hairs. The



Cocoon and pupa of an Arctian.

cocoon is oval, loosely constructed of the hairs of the caterpillar interwoven with a few threads of silk. The chrysalis is stout, smooth, and dark brown in color. The moths of this genus come readily to a bright light, and a collector in the country will often find them flying about his room on warm summer evenings. They have a habit of feigning death when captured. Several of the species give off a strong odor when handled, which is probably a protection to the insect from its enemies.



Arctia nais.

Arctia nais is a widely distributed insect, being found over the whole of the United States and the lower part of Canada. This insect, according to Edwards, has, on account of its variation received

no less than nine different names. The wings are usually an inch and a half in expanse and are of a pale yellow, pinkish near the base of the lower wings, and striped on the forward pair by broad bands of black with triangular black spots near the outer margin. The lower wings also have several black spots. These spots and bands sometimes cover almost the entire surface, giving the moth a very different appearance. The abdomen is usually flesh color with a band of black on each side and one on the top. The caterpillar lives on the dandelion. Its hairs are black on the back, and brown on the sides.



Aretia arge.

One of the most common species of this genus is *Aretia arge*. The general color is a flesh tint, being intensified to reddish along



Aretia phalerata.

the outer margins of the lower wings. Narrow triangular black spots and long black stripes adorn the upper wings, with several black spots on the lower wings. A row of black spots extends along each side of the abdomen and one row down the back. This insect

expands nearly two inches and makes its appearance in June and July. The caterpillar is dark gray, sometimes almost black, and is thinly clothed with clusters of spreading black hairs which spring from dark colored warts. The larvæ live on the plantain.

Another common species is *Arctia phalerata*. The thorax and upper wings are yellowish-buff with broad black stripes and triangular spots, and the abdomen and lower wings are reddish-pink with black spots and markings.



Arctia virgo.

Our largest and most beautiful species of this genus is *Arctia virgo*. The upper wings are flesh color marked with broad stripes of black, and the lower wings are vermilion red and deep reddish-pink at the base with large black spots. The thorax is the color of the upper wings, with three black splashes, and the abdomen is the color of the lower wings with a black band on each side and on the back. I have never found this insect abundant but have taken it in August with a lighted lamp in Massachusetts and in northern Ohio. The insect expands two and one-half inches. The caterpillar is brown, covered with brown hairs, is two and a half inches long when fully grown, and feeds on pigweed, dock and plantain.

The common snow-white miller, *Arctia virginica*, has a wide distribution. The wings are pure white with one or two small dots of black, while the abdomen has the customary black spots of the genus on the sides and back with a yellow stripe on each side. The caterpillar of this moth is the "yellow bear," which is a common pest in our vegetable gardens, devouring almost everything in the way of herbaceous plants it finds. Its body is covered with long yellow or

tan colored hairs, and it has an interrupted stripe of brown on either side and a brown band between each of the segments. The insect passes the winter in its hairy cocoon, and in the following June appears as a moth.



Larva of *Cynia egel*.

On the milkweed may often be seen numbers of little caterpillars covered with tufts of black, white and orange hairs. These are the harlequin caterpillars, and are the larvæ of a plain little blue-gray moth, *Cynia egel*, which makes its appearance the latter part of June, after having passed the winter in the pupa state in its oval hairy cocoon. The abdomen of the moth is yellow above, with a row of black dots down the back, resembling the *Aretians*.

Utetheisia bella is a very beautiful moth, and is widely distributed over this country. Its habits are similar to a following species, the soldier moth, and it is often found in low grassy districts in considerable numbers, taking to wing readily when disturbed. When handled it exudes an oily substance with a peculiar odor, and remains perfectly still, as if dead, soon, however, taking wing if not further molested. These habits, combined with a probably very bitter taste, have doubtless preserved this gayly colored little creature from extinction. The larva is one and a half inches long, and is yellow and white in color sprinkled with black dots. It feeds on herbaceous lowland plants.

The anchor moth, *Callimorpha interrupto marginata*, is a rather rare moth, and is about the same size and marked with brown similar to the soldier moth, except that it is yellowish where the other species is white.



UPPER SIDE



UNDER SIDE

UTETHEISIA BELLA

The soldier moth, *Callimorpha lecontei*, is a common species to be found among rank grass or bushes near brooks or swamps in June and July. When disturbed it flies a short distance and quickly



Callimorpha lecontei.

hides away among the grass or shrubs. This insect is rarely seen singly, and often while walking among the grass of low land I have started half-a-dozen of these moths from their hiding places. The wings are creamy white marked with dark brown, the head is yellowish, and a brown stripe extends down the back, the rest of the body being creamy white. In some specimens the brown markings of the fore wings cover nearly the whole surface, leaving but a few white patches. The larvæ are thinly clothed with hairs, and are brown in color with yellow stripes. They are night-feeders on herbaceous plants, hiding by day.



Hypoprepia miniata.

A beautiful little moth which sometimes comes to the lamp of the collector is the striped footman, *Hypoprepia miniata*. It is deep scarlet with three dull brown stripes running lengthwise of the upper wings and a broad border of the same color along the margin of the lower wings. The dark brown spiny larva feeds upon lichens, and makes a thin silken cocoon. The moth appears early in June.

Another species closely related to the foregoing and easily mistaken for it is *Hypoprepia fucosa*. This moth is somewhat smaller than *Hypoprepia miniata* and may be distinguished from it by the color of the wings, which are yellow and red.

ZYGENIDÆ.

In the family *Zygenidæ*, the species have prominent heads, long narrow wings thinly covered with scales, leaving naked spots in some species. Some of the members of this family are adorned with gay colors, and a large number are diurnal in their habits, rifling the flowers of their sweets in the hot sunshine. The larva is short, thick, and usually adorned with small tubercles. Many of the species are hairy, others naked. Most of them spin silken cocoons, while others utilize the hairs of their coat for a covering for the pupa, binding them together with a few silken threads. Others again make no cocoon whatever. The pupa is usually short and stout-bodied.



Otenucha virginica.

Otenucha virginica may be seen on the white clusters of elder blossoms during the sunny hours. It is not timid and is slow to take flight. The head and sides of the thorax are orange, the fore wings are smoky-brown, the hind wings bluish-black, and the body is deep purplish-blue. The wings expand two inches or over. The larva is hairy and feeds on grasses. It constructs a thin hairy cocoon.

A very long and narrow-winged species is *Lycomorpha photus*. This insect expands a little over an inch; in color the shoulder covers and base of both pairs of wings are orange, the rest of the insect being bluish-black. This moth flies only in the daytime, and may frequently be seen extracting the honey from the goldenrod by

the roadside. The hairy greenish larva feeds on lichens growing on stones, and makes a thin silken cocoon.



Lyeomorpha pholus.

A prettily colored moth is *Eudryas grata*. The thorax and fore wings are white, with brown, pinkish-brown and greenish-brown markings, while the abdomen and lower wings are yellowish-buff



Eudryas grata.

with markings of brown and pinkish-brown. This insect expands about two inches. The caterpillar feeds on the leaves of the Virginia creeper and the grape. It is a peculiar looking creature, being blunt at the posterior end and crossed by numerous bluish and orange bands and fine black lines and spots. The transformations are passed in the ground.

Another species, differing greatly in the perfect insect but very similar in the larval state to the foregoing, is *Alypia octamaculata*. This insect expands something over an inch, and is black with the exception of two large yellow spots on each of the fore wings, two large white spots on each of the hind wings, the shoulder covers (which are yellow), and tufts of reddish-orange hairs on the legs. This moth is an active creature, flying about in the sunshine, sud-

denly disappearing and as suddenly returning. It is very common in some parts of the country. The larva is banded with white and orange and with narrow black lines and rows of black dots. This species has eight black lines to each segment, while the preceding



Alypia octomaculata.

has but six. It feeds on the leaves of the grape and Virginia creeper, and transforms into a pupa in an earthen cavity beneath the surface of the ground. There are usually two broods in a season, one coming forth in June and another in August and September.



Psychomorpha epimenis.

Psychomorpha epimenis I have found a rather rare little moth, although I have heard of its being abundant in some parts of the country. The insect is black, with a large yellowish-white spot on each fore wing and a large brick-red spot on each hind wing. It expands about an inch. The caterpillar feeds on the grape and Virginia creeper, drawing the ends of the young shoots together with silken threads. In shape it resembles the foregoing, but has a bluish appearance; being banded with black and white lines. It transforms in the ground.

ÆGERIDÆ.

Glass-wings.

The moths belonging to the family *Ægeridæ* are rather small, and are readily distinguished from all other moths by their resemblance to bees and wasps. They have narrow, mostly transparent wings, long bodies, with a fan-shaped tuft of hairs at the posterior end, and spindle-shaped antennæ. Most of the species are gayly colored and all are diurnal in their habits. The larvæ are borers in the stems and roots of trees and shrubs, and do a great deal of damage to some of our cultivated fruit trees. They are grub-like, whitish creatures with brown heads. Some kinds are sparsely covered with fine hairs. The transformations usually take place in the excavations made by the larva, where a rude cocoon is constructed by cementing together fragments of wood. The pupa is armed with minute spines on its abdominal rings, and when about to break the shell makes its way out of the cocoon and along the passage to the opening previously made by the caterpillar. Here the moth escapes, often leaving the empty shell protruding from the hole.

*Melittia cucurbitæ.*

Melittia cucurbitæ is our largest native species of this group, and expands about an inch and a half. The upper wings are black, the lower ones transparent, edged with a fringe of long hair-like scales. The abdomen is orange with a few black dots, and the posterior pair of legs have long orange and black hairs. The larva infests the squash, cucumber and melon, living in the interior of the vine and devouring its substance.

Another species familiar to cultivators of peach and plum trees from the destruction caused by the larva is *Ægeria exitiosa*. The male and female moths differ greatly in size and general appearance. The male has all four wings transparent, the veins and margins being steel blue. The body is also blue, with a yellow tuft at the extremity. In the female moth the fore wings are dark blue and opaque, while the hind wings are transparent, and the abdomen is

crossed by a broad band of orange. The larva feeds on the inner bark and young wood of peach and plum trees, infesting them



Ageria exitiosa. Male.



Ageria exitiosa. Female.

especially near the ground. So destructive is this pest in some regions as to have caused the abandonment of peach growing.



Ageria tipuliforme.

The currant borer, *Ageria tipuliforme*, is scarcely less destructive than the preceding, and, as its name implies, the larva bores in the stems of the currant. The larva feeds on the pith of the plants, causing the leaves to turn yellow and eventually the plant to die. The moth is smaller than the preceding, expanding about three-quarters of an inch, is blue-black in color, the wings being transparent, with a coppery colored bar at the tips of the forward pair. The shoulder covers and three lines across the abdomen are yellow. The moth makes its appearance in June.



Ageria pyri.

A small species, whose larva bores under the bark and in the young wood of the pear tree, is *Ageria pyri*. The insect expands half an inch. Its general color is purplish-black above and yellow beneath; but the wings are transparent, with a band of copper-brown at the tips of the forward pair, and the body is crossed with two narrow lines and one broad band of yellow, while the fan-shaped tuft of hairs at the end of the abdomen is yellow.

*SPHINGIDÆ.**Dusk-flyers.*

The interesting group of moths that come under this head have long been favorites with collectors. Their trim, graceful shapes, the pleasing tints and large size of many of the species, combined with the grotesque attitudes assumed by the larvæ, make them objects of unusual interest. The name "Sphinx moths" was given to the group by Linnæus on account of a fanciful resemblance which the



NOTICE.

THE reprint of pages 139 to 142, sent herewith, is to replace the same pages issued with Section III of this work.

THE PUBLISHER.

These moths have powerful, long, narrow wings, particularly the upper pair, and stout spindle-shaped bodies. The antennæ are stout, thickened in the middle and usually supplied with a curved hook at the tip. The tongue is often very long, although in some species it is short. The eyes are large and prominent. In one group the wings are transparent, resembling in this respect the *Ægeriadae*. They have strong, well-developed legs. Most of the species fly only at dusk of morning and evening, while others fly late into the night, and a few only in the daytime in the hot sunshine. The larvæ are usually smooth, naked caterpillars, green in color, with oblique light stripes along the sides, and supplied with a sharp curved horn on the top of the next to the last segment. In some species this caudal

crossed by a broad band of orange. The larva feeds on the inner bark and young wood of peach and plum trees, infesting them



Egeria exitiosa. Male.



Egeria exitiosa. Female.

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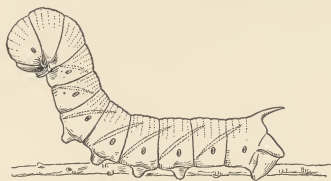


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The interesting group of moths that come under this head have long been favorites with collectors. Their trim, graceful shapes, the pleasing tints and large size of many of the species, combined with the grotesque attitudes assumed by the larvæ, make them objects of unusual interest. The name "Sphinx moths" was given to the group by Linnæus on account of a fanciful resemblance which the



Larva of Sphinx Moth.

larvæ bear while at rest to the fabled Sphinx. Clasping the twig with the posterior feet the caterpillar raises the forward part of the body and remains in this attitude sometimes for hours. These insects also go by the common name of Humming-bird moths, from the habit of the insects, which while poised on rapidly vibrating wings extract the honey from the flowers. Hawk moths, too, is a name given this group, probably from the strong, direct flight of the insects.

These moths have powerful, long, narrow wings, particularly the upper pair, and stout spindle-shaped bodies. The antennæ are stout, thickened in the middle and usually supplied with a curved hook at the tip. The tongue is often very long, although in some species it is short. The eyes are large and prominent. In one group the wings are transparent, resembling in this respect the *Ægeriadae*. They have strong, well-developed legs. Most of the species fly only at dusk of morning and evening, while others fly late into the night, and a few only in the daytime in the hot sunshine. The larvæ are usually smooth, naked caterpillars, green in color, with oblique light stripes along the sides, and supplied with a sharp curved horn on the top of the next to the last segment. In some species this caudal

horn is to be found only in the young caterpillars, an eye-like tubercle taking its place in the more mature larva. That this horn is of any use to the caterpillar I have yet to learn. It may be the survival from its ancestors of a sting; but if such is the case it has entirely lost its value as a weapon of defence. The transformations usually take place a few inches beneath the surface of the ground. A few species make rude cocoons by drawing about themselves leaves and twigs on the ground under their food plant, and fastening



Pupæ of Sphinx Moths.

them together with a few silken threads. They usually pass the winter in a pupa state. The chrysalis in some species is furnished with a long tongue-case which stands out from the body and is often compared to the handle of a jug.

Among the clear-wing sphinxes, our most common species is *Hemaris thysbe*. In this insect the wings expand about two inches and are transparent, the veins and margins being reddish-brown. The head and thorax are olive-green; the upper part of the abdomen is crossed by a broad band of buff, while the lower part is rich reddish-brown or maroon, and reddish-brown beneath. The fan-like tail is black on the sides, with a yellowish-brown central tuft of hairs. The under side of the thorax and legs of the insect are light yellow. This insect is sometimes very common in June and July, and may be seen on hot summer days hovering over the flowers of the garden extracting their nectar. It looks not unlike a humming-bird in miniature while on the wing. The blue blossoms of the pickerel weed, which grows so plentifully along the margins of most ponds and

slow flowing rivers is a favorite flower with this moth. It looks as if suspended in the air while poised before the spike of blossoms, its wings moving so rapidly as to be scarcely visible. The larva, which feeds on the leaves of the snow-ball, is nearly two inches long, and is



Hemaris thysbe.

light green in color. When about to pupate it draws a few leaves and twigs about itself on the surface of the ground and makes a rude cocoon by spinning a few silken threads to hold them together. In this it passes the winter in the chrysalis state.



Hemaris diffinis.

Another species of clear-wing more common farther south than the preceding is *Hemaris diffinis*, or the bumble-bee hawk moth. It is somewhat smaller than *Hemaris thysbe*, the veins and margins of the wings are darker brown, the abdomen beneath and legs are black; while the abdomen alone is crossed by a broad band of rich reddish-brown. The top of the thorax is covered with light yellow hairs

which give it while on the wing a bee-like look. The habits of the insect are much the same as the preceding. The larva feeds on the leaves of the bush honeysuckle and it makes a clumsy cocoon of leaves and sticks on the ground under the bushes.



Deilephila chamænerii.

Deilephila chamænerii expands two and a half inches and is boldly and prettily marked. The body is olive-green above, with a white line along the sides of the head and thorax, and white and black spots with a pinkish shade on the sides of the abdomen. The fore wings are dark olive-green or greenish-brown, with an irregular buff stripe extending from the lower margin of the wing near the body to the tip; the outer margin is bordered by a band of gray. The lower wings are black, with a wide pink band extending across them with a white spot next the inner margin. This insect, although apparently not so common as the following species, is quite widely distributed. It may be seen early of a summer evening about the flowers of the evening primrose and the petunia, and is often so intent on its repast as to allow itself to be closely approached. The larva is unknown to me, but is described by Packard as "bronze-green, dull red beneath, with nine round cream-colored spots, pupilled with black, and having a dull red caudal horn." It feeds on the leaves of the willow herb.

Deilephila lineata expands from three and a half to four inches and is one of our prettiest sphinx moths, its close fitting scales and spindle-shaped body with the abdomen ending in a pointed tuft of hairs, giving it a trim and neat appearance. It is colored much

like the preceding species except that there are several white lines following the veins and extending diagonally across the upper wings. There are also white lines on the thorax, and the abdomen has a decided rosy tint besides the black and white markings. This insect is found from the Atlantic to the Pacific coast, and extends well up into Canada and also into the southern parts of the country, as far down as the Gulf of Mexico. It is very abundant in some parts of



Dellephila lineata.

the country, and I have taken it in numbers in Sacramento, Cal., where early on a June evening, even before sunset, it might be seen flying in wide circles over the fields of wild flowers or poised before the spikes of blossoms daintily extracting their sweets. The larva is yellowish-green in color, and feeds on the leaves of the apple, plum and currant. It is said to be double-brooded in the southern part of the country.

On the grape and Virginia creeper may often be seen during July and August the larva of *Everyx myron*. This caterpillar is about two inches long when fully grown, green in color with a whitish stripe edged with dark green along each side extending from the head to the caudal horn, and oblique markings of yellow shaded behind with dark green also on the sides. There is, too, a row of pink spots down the back. Occasionally a specimen may be found of a strong pink, brownish-pink or even reddish color. In such an

insect the stripes and lines are usually pale pink instead of yellow or white. The two forward segments next the head are small, and those farther back much swollen, so that the head and first segments may be partly retracted and almost concealed beneath the folds of



Everyx myron.

the large fleshy parts, giving the caterpillar a humped appearance and suggesting the common name of hog caterpillar. These larvæ are often attacked by parasitic insects, whose grubs feed on the flesh and fat of the caterpillars which later may be found in an enfeebled con-



Pupa of Everyx myron.

dition crawling about with the cocoons of their destroyers clinging to their sides and back. The larva makes a poorly constructed cocoon on the surface of the ground, composed of leaves held together with a few silken threads. The chrysalis is yellowish-gray and is

sprinkled with black dots. The moth expands about two and a half inches. The body and forward wings are olive-green, the wings



Larva of *Everyx myron*.

being crossed by a vaguely defined band of flesh color, while the lower wings are brick-red in color with a softly shaded patch of olive-green at the lower angle. This insect is widely distributed over this country.



Everyx cherilus.

Another insect not rare in the eastern half of the country is *Everyx cherilus*. The predominating color is reddish-brown, but the fore wings are crossed by bands of yellowish-brown and pinkish-gray, while the lower wings are brick-red with a dark brown shade along the lower margins. This insect may be taken about lilacs, and may occasionally be seen flying around the electric lights in our towns.

Philampelus pandorus and the following closely allied species are grand insects, easily holding first place among our native sphinxes. The expanse of wing is from four and a half to five inches, and magnificent is the only word that seems to do justice to the size and coloring of these fine moths. The present species is olive-green and gray with dark velvety patches of greenish-brown on the upper, and

black on the lower wings. A rosy tint is diffused over the greens, grays, and olives which are softly blended and shaded into one another in a most charming manner.

A designer of good taste and refinement might evolve from this moth's velvet coat a dress of modest loveliness for a lady which would make her the envy of her fair sisters. The sight of such an insect in its perfect beauty having recently spread its wings from the narrow confines of its hard, brown chrysalis, is apt to set one wondering why



Philampelus pandorus.

our costume makers do not go more to Nature's art school for their suggestions.

The habits of this insect are much the same as those of other long-tongued species of sphinxes, which in the dusk of morning and evening extract the nectar from the fresh opened flowers. It is sometimes to be seen flying in circles about the electric lights in cities, but I have never known it to be attracted by the light of a common kerosene lamp. This is true of most of the sphinx moths. It takes the powerful rays of the electric light to dazzle and bewilder them.

The larva of this moth is large and fleshy, and like the preceding it can, by contracting the first three segments, almost completely hide

them beneath the fleshy folds of the much swollen following segment, thus making the insect look very blunt and humped at the anterior end. It is smooth, without hairs or tubercles except an eye-like spot on the top of the posterior end of the body. The color of the larva is usually light green, although specimens are to be found of a flesh or brownish-pink color. Along the side runs a row of broad oval spots, yellowish in color, obliquely placed on the segments. The forward part of the body is covered with a fine stipple of black dots. The young of this larva is interesting from the fact that it is usually light pink, and has a curled spine on the posterior end of its body, which after two or three moults disappears, leaving only the eye-like tubercle before mentioned.

This caterpillar feeds on the leaves of the grape and Virginia creeper, and on account of its large size, often three or four inches long, and as thick as one's thumb, it consumes large quantities of the leaves, even eating the midrib down to the stem. It is rarely, however, found sufficiently abundant to do any great damage.



Larva of *Philampelus pandorus*.

In *Philampelus achemon* the larva very closely resembles that of the preceding species both in its habits and its shape and coloring, except that the spots arranged along the sides are much longer and narrower, are scalloped on their edges, and a long yellowish stripe extends above the spots the entire length of the caterpillar. This species also feeds on the grape and Virginia creeper, and when fully grown in the latter part of August or early in September it, like the larva of the preceding species, burrows into the earth a few inches, where it changes to a pupa without making a cocoon of any kind, simply excavating a smooth cavity or cell in the soil. The perfect insect comes forth the next July. This moth is somewhat smaller than *Philampelus pandorus*, but is very beautiful, the forward wings and the body of a light pinkish-brown with intensely dark brown patches

arranged as shown in the figure. The lower wings are rose color, being light buff next the body, and bordered externally with light brown and dark brown spots and shadings. This insect is probably less abundant than *Philampelus pandorus*. Both are widely distrib-



Philampelus achemon.

uted, being found from the Atlantic to the Pacific coasts of our country, and from Canada well into the Southern States, while allied species occur in Mexico.

The tomato-worm moth, *Macrosila quinquemaculatus*, is one of our largest sphinx moths, and although ashen gray with a few dark brown and black markings, is still a fine insect. The length of the tongue of this insect is very remarkable, and on this account it is able to extract the nectar from our largest and deepest flowers. It is interesting early on a quiet summer evening to stand beside a bunch of phlox or a bed of petunias and watch this moth hovering over the flowers. It is strong and rapid on the wing, and on account of its size and the directness of its flight looks quite bird-like.

The legs of the moth are armed with sharp spines, so do not try the unpleasant experience of taking one of these muscular insects by hand. Even if through your love for collecting you manage to hold it, the specimen is liable to be ruined in the struggle to escape.

The larva of this insect feeds on the leaves and even the young

fruits of the tomato. It will also eat potato and tobacco leaves, and in some parts of the country does great injury to the tobacco crop



Macrosila quinquemaculatus.

unless men are constantly engaged in "picking worms" from the plants.



Larva of *Macrosila quinquemaculatus.*

The larvæ are usually green with a curved caudal spine. Specimens are occasionally found of a dark brown or black color.

One can frequently locate the larva on its food plant by shaking

the stems and listening for the snapping noise made by the jaws of the larva as it swings its head from side to side in a menacing manner. It is quite harmless, however. The pupa is interesting from its tongue case, which looks not unlike the handle of a jug. It is frequently found while spading or ploughing the garden. The pupa passes the winter several inches under ground, and works its way to the surface in spring when it is about to break the pupa case and emerge a perfect fly. (See figure on page 140.)

This insect is widely distributed over the whole of the United States and Canada.



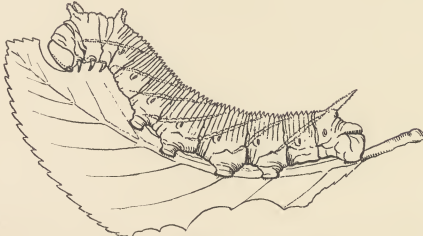
Macrosila carolina.

The Carolina sphinx, *Macrosila carolina*, very closely resembles the foregoing in all three stages of its existence, and also feeds on the same plants. It is, however, a somewhat smaller insect, and the moth is more brownish in color with less gray, while the black markings on the lower wings run more together and are not zigzag as in *quinque-maculatus*. The larva is green, stippled with white dots, with seven oblique whitish stripes, and a light longitudinal line extending along each side. The stout caudal horn is usually bluish.

They are frequently, among the country folks, considered venomous, the caudal horn probably giving rise to the idea that they can sting.

A large caterpillar, which feeds on the leaves of the elm and is

interesting from its protective mimicry, is the larva of *Ceratomia quadricornis*. This larva is green, of the exact tint of the underside of the elm leaf, and along its sides are a number of oblique light



Larva of *Ceratomia quadricornis*.

lines. A line down its back is serrated, and on the forward part of the body are four soft green horns, also serrated. While this insect



Ceratomia quadricornis.

is at rest clinging to the midrib on the underside of the elm leaf it is a difficult creature to see, and one may gaze directly on it and still think he is looking at a slightly curled leaf. The light line down

the back answers to the midrib of the leaf, the oblique stripes on the sides look like the main veins, and the green horns closely resemble the notched tip of the leaf. One may readily locate the creature by observing the pellets of excrement on the ground under the trees, but even when he is known to be on a certain branch he is not easily seen. The caterpillars may sometimes be seen on the trunks of trees as they are making their way down to the ground to undergo their transformations in the soil. The moth is four inches or more in expanse and is light brown in color, with lines and markings of dark brown, black and gray.

The caterpillar descends into the ground during August or September and emerges a moth the next July, when it crawls up the trunk of an elm tree, waiting until evening when its wings are sufficiently strong to enable it to take flight.



Daremma undulosa.

Daremma undulosa is a good-sized moth of a brownish-gray color, with a few light gray and dark brown or black markings distributed as shown in the figure. It is not a rare moth and will sometimes be attracted by the collector's lamp. It is rarely taken about flowers as it does not seem to be as partial to sweets as many of the sphinxes.

A small moth somewhat resembling the preceding in its markings is *Dolba hylæus*. The upper wings are light reddish-brown and gray with many black and brown lines. The lower wings are sooty-brown

and white. The thorax is reddish-brown with white stripes on the sides, and the abdomen has several white bars on the sides with two rows of white dots down the back. This insect is common in the southern states and I have taken a few in Massachusetts and Ohio.



Dolba hylæus.

A very common sphinx moth with a wide geographical range extending over the larger part of this country and Canada is *Sphinx gordius*. This insect is dark sooty gray and light gray or white with several black bars on the sides of its body, and a few pen-like mark-



Sphinx gordius.

ings also in black on the wings. It is very partial to lilac blossoms, and when the clusters of flowers are fully expanded it may sometimes be seen at dusk on a warm quiet evening in some numbers. So intent are these moths on their feast of honey that one may approach

quite near them and watch them guide their long flexible tongues into the tiny flowers. The motion of their wings is so rapid that they make a slight whirring noise and in the half-light are almost invisible. The larva is green with light oblique stripes on the sides, and it feeds on the leaves of the apple though it is rarely sufficiently plentiful to do much damage.



Sphinx chersis.

On the ash and lilac, in September, may be found a plump, handsome green caterpillar, whitish on the back and having seven oblique light yellow stripes on its sides edged above with dark green. This is the larva of *Sphinx chersis*. The moth is ashen gray in color with several black and white bands on the sides of its body, two heavy black lines on its lower wings and a few pen-like markings in black on its forward wings. It is a large powerful moth and has a strong, rapid flight.

Sphinx drupiferarum is also a good-sized moth, being four inches or over in expanse of wing. The general color is dark sooty brown. The outer margin of all four wings is light brown while a large area along the upper margin of the upper wings and a band across the lower wings is gray. Black and white bands alternate on the sides of the body. The larva feeds on the leaves of the plum and hackberry. It is light green with white stripes edged above with purple.

Sphinx kalmie expands about four inches, and is buff and rust-red in color, with reddish-brown markings streaking the upper wings. It is not a rare insect, and may be taken early in the season about



Sphinx drupiferarum.

the lilac blossoms. The larva is pale green with oblique bands of yellow on the sides, edged above with black and blue. It feeds on the leaves of the lilac and laurel.

A plainly tinted but gracefully shaped insect is *Chloerocampa tersa*. In this moth the body is long and tapering, ending in a tuft of hairs. The upper wings are long, narrow and pointed, while the lower pair is small in proportion. Its body is tan with a yellowish stripe on either side, and the thorax and head is brown with a light gray band also on the side. The upper wings are light brown crossed diagonally with numerous brown lines. The lower wings are black margined with brown, with a row of light yellow spots extending above the brown margin. This insect is more plentiful in the southern parts of the country, and is rather common in Washington, D. C., where about the electric lights they may frequently be taken in July and August.

One of our earliest sphinx moths to be seen in the spring is *Thyreus abbotii*. The lilac blossoms are very attractive to this species, and on a May evening it may be seen hovering about the clusters of flowers. It is not very shy, and may be easily taken with the net. The general color of the moth is dark purplish-brown. The fore wings are crossed by numerous black lines, while a broad band of black and

dark brown extends along the outer margin of the lower wings, the rest of the wing being yellow. The body is bluish-gray and brown, with lines and bands of black. From the sides of the body spring tufts of



Chloeroecampa tersa.

hairs, and three spreading plumes of long yellowish-brown hairs adorn the end of the abdomen. These latter the insect can spread or contract



Thyreus abbotii.

at pleasure, and are no doubt of value in guiding its rapid flight. The caterpillar of this moth feeds on the leaves of the Virginia creeper, and in its markings closely resembles a section of the stem of the vine.

It is grayish or greenish brown in color, crossed by numerous darker brown markings. The under side is pink. At the posterior end is an eye-like spot or tubercle, making the insect look, as one observer worded it, "as if the worm had a head at each end." When handled the caterpillar twists its body vigorously from side to side, making at the same time a squeaking noise. The winter is passed in the chrysalis state, a few inches beneath the surface of the ground.



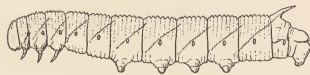
Amphon nesus.

A little jewel among the sphinx moths is *Amphon nesus*. It expands a little over two inches, and the wings are very much scalloped. The ground-color of the fore wings and thorax is purplish-brown, the wings being crossed by dark velvety brown markings and faint yellowish lines, with a spot of reddish-brown near the tip of the wing. The lower wings are margined with a broad band of brown edged with yellow, the rest of the wing being reddish-brown. The abdomen is dark reddish-brown, lighter on the sides, and is crossed by two conspicuous bright yellow bands. The end of the abdomen bears three tufts of long dark brown hairs which may be spread or contracted at the pleasure of the insect. The white lilac and syringa are favorite flowers. Its flight is not so rapid as that of other members of the family, and it may be easily taken, even by hand.

I have never found this insect abundant but have had numerous specimens sent me from Ontario, Canada, and also from Virginia.

The genus *Smerinthus* contains some large and very handsome moths. Unlike the species of sphinx moths already described, in this genus the tongue is very short, almost wanting in fact, and can be of little use to the insect. The fore wings are scalloped on their outer

edges, and the moths are sluggish in their habits, flying only by night, and then in a vague and uncertain manner, contrasting greatly in this respect with the strong, direct flight of most of the species of the



Larva of *Smerinthus*.

family. The larvæ are usually green in color, and their skin is rough and granular, giving it a hard sandpaper-like feeling. The transformations are passed in the ground.



Smerinthus geminatus.

Our beautiful little *Smerinthus geminatus* is not a rare insect, and may often be taken with the collector's lamp in July. The upper wings are gray with a faint rosy cast, and are crossed by lines and bands of olive and rich velvety brown. The thorax is also gray, with a large triangular patch of dark brown occupying the middle. The lower wings are rich carmine margined with gray, with a large black spot located near the inner angle of the wing, in which are two bluish-purple spots. The larva of this insect lives on the leaves of the apple, plum, willow and ash, and is green in color with yellow stripes on the sides. Its skin is covered with fine white granules, and it has a triangular head. The pupæ of this species may often be found in connection with that of the following, in the soil at the roots of ash and willow trees.

Smerinthus excecatus is not so exquisitely colored as the preceding species, but is still, when freshly hatched from the pupa, a very pretty insect. Its general color is fawn, with lines and bands of brown and



Smerinthus excecatus (male).

tan. In the middle of the lower wings is a rose-colored patch, and near the inner angle is a large black spot with a dim blue centre. The eggs of this moth are large in proportion to its size, are oval in shape,



Smerinthus myops.

transparent green in color, and look not unlike malaga grapes in miniature. The larva is green with yellow stripes on the sides. The caudal horn is blue. This caterpillar feeds on the leaves of apple,

wild cherry, elm, ash, etc., and may be found near the tips of the branches devouring the young and tender foliage. Young trees and bushes seem to be more subject to the attacks of the larvæ of these moths than older and larger trees. This insect is found from Canada to Virginia throughout the Atlantic States.

A dark brown insect somewhat resembling the foregoing is *Smerinthus myops*. The fore wings and body are dark purplish-brown with light purple lines and markings, and the lower wings have the eye-like spot of the preceding species, but are much darker generally. In



Triptogon modesta.

habits the two species closely resemble each other. While at rest hanging from the stem of a plant, the scalloped outline of the wings of these insects, together with their brown or tan colors and the peculiar bent attitude in which the body is held, give them a resemblance to brown and withered leaves. So complete is their mimicry that one may be obliged to touch the insect before being sure of its identity.

A fine large, but rather rare, insect having a wide range over the northern half of the country is *Smerinthus* or *Triptogon modesta*. This moth expands, in a fine specimen, from five and a half to six inches, and its colors are soft and pleasing. The outer two-thirds of

its fore wings and the outer margin of the lower wings are olive. The inner third of the upper wings and the inner margin of the lower wings are light gray. The middle of the lower wings is dull carmine, while near the inner angle is a bluish-gray patch having a curved black line over it. The body is greenish-olive. This fine moth is rarely captured by the collector, but it may be reared from its larva, which is not uncommon, and is to be found feeding on the leaves of the poplar and cottonwood in September. It is a large green caterpillar three or four inches long, and on account of the rough, white granulations with which its body is covered, it has the appearance of being sprinkled with dew or frosted. A closely allied insect or a variety of this same species is rather abundant in the western states and on the Pacific coast of this country.

MOTHS AND BUTTERFLIES
OF THE UNITED STATES

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East of the Rocky Mountains

By S. F. DENTON

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RHOPALOCERA

THE BUTTERFLIES

SUB-ORDER RHOPALOCERA. *The Butterflies.*

THE hard and fast lines fixed by naturalists do not really exist in Nature. As daylight blends into darkness and night again into day, or as the colors of the rainbow softly shade into one another, the violet into the blue, and the blue into the green, etc., so the different groups of insects pass by almost insensible gradations one into another.

The most noticeable difference between the moths and butterflies is in the shape of the antennæ, being nearly always pointed in the former, and blunt or knobbed at the ends in the latter. This, however, is by no means a sure guide, as many of the Sphingidæ have club-shaped antennæ, while the lowest group of the butterflies, the *Hesperidæ*, are furnished with antennæ having hooked extremities with acutely pointed ends.

None of the butterflies have the wings joined with the loop and bristle usually found among the moths. The butterflies are all day-flyers, thus differing in their habits in a marked degree from the majority of the moths.

The surface of the eggs of butterflies is often ornamented, while the eggs of most of the moths are plain and smooth. The larvæ of all butterflies, with the exception of a few of the lower species, are external feeders, and, unlike the moths, except among the *Hesperidæ*, they spin no cocoons, the naked chrysalis being usually suspended from a silken mat by the posterior extremity and either with or without a band of silk about the middle of the body.

These chrysalides are of various shapes, some angular, others bearing spines and horns, while many of them are objects of extreme beauty; as handsome as jewels and looking exactly as if embossed with gold. The chrysalis stage usually lasts about twenty days, although in a number of species the winter is passed in this stage.

The butterflies, while at rest, usually hold the wings upright, back to back, while the same organs in the moths are generally folded roof-shape over the abdomen, or expanded flat upon the support of the insect. In coloring, the butterflies are generally much more striking than the moths, their wings being ornamented in many

species with bold dashes of color, lacking that soft blending so characteristic of most of the moths.

The butterflies, too, though strong and rapid of flight many of them, have much smaller bodies generally in proportion to the size of the wings than the moths. The eyes are usually well developed, and the tongue is sufficiently long to enable the insect to extract the sweets from flowers, or sip moisture from the ground. The legs of butterflies are usually well developed, except in the *Nymphalidæ*, where the first pair are nearly aborted.

HESPERIDÆ.

Skippers.

The most moth-like of all butterflies are the *Hesperidæ*, a group containing a host of small, plain-colored insects, usually very abundant in our fields and meadows.

These insects are stout-bodied creatures with large heads, prominent eyes and hooked or pointed antennæ, suggesting those of the Sphinx moths, placed wide apart at their base. The palpi are thick and hairy, making them look blunt and clumsy. The lower wings, while the insects are at rest, are often spread horizontally, while the forward pair are raised nearly vertically above the back. In coloring, they are usually very plain, black, brown and tawny-yellow predominating in our native insects. A few of the tropical species, however, are gayly colored. Some of the species bear tails similar to those on the lower wings of the *Papilios*. The flight of these insects is rapid, but generally continued but for short distances at a time. The jerking manner of their movements, with their restless darting from place to place, has earned for the group the common name of skippers. They are lovers of flowers, and the fields of clover, the blossoms of milkweed, elder and various lowland shrubs and plants usually swarm with them.

The larva of the *Hesperidæ* is cylindrical in the middle, tapering toward both ends. It has a large head placed on a narrow neck, which gives it a most peculiar appearance. It is smooth, naked, or at the most, downy and usually of dull and sombre tints. It is solitary in its habits, and is largely a night feeder, inhabiting by day a neatly constructed nest made of silken threads inside a curled leaf. When not feeding, the larva retreats into this nest, and its large, hard head acts as an operculum, completely filling the entrance and

keeping out its enemies, reminding one in this respect of the larva of some species of caddis flies. The chrysalis is smooth, shaped like



Larva of Hesperidæ. (*Eudamus tityrus*.)

that of a moth, and is powdered with a bluish dust. It is suspended by the tail within its thin silken cocoon, and has a thin band of silk passing around the body after the manner of the *Papilionidæ*.

At the beginning of the skippers, as they are often termed, is a genus of large, powerful insects which inhabit the southern states, New Mexico and Arizona, known to entomologists by the name *Megathymidæ*, or giant skippers. In this genus the head is not so large in proportion to the rest of the body as in most of the members of this family, but the body is very stout and well supplied with muscles to work the stiff and proportionately short wings, making these insects very strong on the wing. The antennæ, though furnished with a long curved knob, are not pointed nor recurved into a hook as in most of the *Hesperidæ*. These insects fly very rapidly, but seem as if undecided where to go, and dart first to one side and then the other, suddenly alighting, and seldom remaining more than an instant in a place. All four wings are folded vertically over the back when the insect is at rest, differing in this habit in an important degree from the majority of the skippers.

The best known of this genus is *Megathymus yuccæ*, so called from the larva passing the most of its existence in the stem and root of the yucca or Spanish bayonet. The butterfly is dark umber-brown, the base and the margin of the wings being tinged with yellow. The light markings on the outer third of the upper wings are yellow. All four wings are more or less hairy next the body. The under side is much like the upper, the yellow spots being repeated beneath, but paler, while there are gray scales toward the outer portion of both sets of wings. The female is a good deal larger than her mate, measuring three inches in expanse of wing, the male being but two and one-half inches across the outstretched wings. The coloring is much the same in both sexes. I have never seen the larva or chrysalis of this insect, and know nothing of its early life-history, taking the following interesting descriptions, with its habits, from

a quotation by Prof. G. H. French from Prof. C. V. Riley. The larva lives inside the stem and root of the yucca. The eggs, which are pale green, are deposited singly on the leaves, and when hatched the caterpillar conceals itself in a web near the tip of the young leaf. As it grows, it generally works to the base of the leaf, feeding as it goes, entering the stem when it is about one-fourth grown. The young larva is dark brick-red, with the head and top of the second segment pitchy black. The full-grown larva is two and one-half inches in length, and of a dull, translucent white covered with a white, glistening, powdery secretion of a waxy nature.

The burrow made by this caterpillar often extends two feet or more below the surface of the ground. Before pupating, the larva makes a place of exit for the butterfly, lightly closing the cavity near the end. It then makes a cell sufficiently farther down to give room enough to pupate, and in this it undergoes its transformations. The perfect fly emerges in April or May. There is but one brood in a season. There are two other species of this genus found within the borders of the United States, but their life in the caterpillar and chrysalis state has not yet been worked out. They, doubtless, bore in the stems and roots of sub-tropical plants. Central and South America have representatives of this genus.

To the genus *Thanaos* (*Nisoniades*) belong a number of widely distributed, dull brown or black insects with broad, flat wings, having a few small white dots and sometimes a row of dark purplish markings on the upper wings.

These insects usually appear early in the spring, and are among the first which a collector may take with the net. They are to be found along roads or paths in wooded districts, or in open spaces near woods. They delight to sport among low shrubs and bushes, and fly quite rapidly, two or three chasing each other about from bush to bush, often alighting and spreading their wings out flat, holding themselves ready to immediately take wing. They are quite pugnacious, and readily give chase to other insects that may pass their way. Great care is necessary in separating the species, as many of them resemble each other closely. Some are double-brooded, first making their appearance in April and May, and again the latter part of summer. Although so plain in coloring, these butterflies come at a time when the more attractive and larger kinds have not come forth to delight the collector. They are sufficiently numerous that one may secure perfect specimens with no great difficulty, and the most

sombre butterfly has a beauty of its own when perfect and carefully mounted. Then, too, the life-histories of many of the kinds are still unknown, and a field for investigation lies open to the student.

But two only of our more common species of this genus will be described here. *Thanaos brizo* is very common in the eastern and middle states, being found as far west as the Rocky Mountains, and on warm sunny days in early spring may be found along roads and paths through the forests or the young growths of oak. It often alights on the ground or on low herbage. This insect is very sombre in coloring. The upper wings are dark blackish-brown, with two indistinct and ill-defined rows of dark bluish-gray



Thanaos brizo.

oval spots surrounded by black. The lower wings are brown, with two faint rows of yellowish-brown spots near the lower margin. Underneath, both wings have two rows of yellowish spots.



Thanaos persius.

Thanaos persius is a common insect and widely distributed over the continent. The upper wings are bluish-gray, with three irregular

rows of black triangular spots crossing them. The row of spots near the outer margin is tipped externally with yellowish-brown, while the other spots are outlined with gray. There are several clear white spots distributed on the wings, as shown in the illustration. The lower wings are brown with two rows of faint yellowish-brown spots near their outer margins. The body is blackish-brown. The larva feeds on willow and poplar.



Pholisora catullus.

A much smaller species related to the foregoing is *Pholisora catullus*. In this insect the wings and body are black, or very dark blackish-brown, and the wings are unadorned, save with a line of small white spots near the apex of the fore wings. The head and palpi also have a few small white dots. This little butterfly is distributed over the whole United States.

In the genus *Pamphila* is assembled a large number of species (over one hundred being inhabitants of the United States) of small, stout-bodied butterflies, distributed over the whole continent, and often very abundant in point of number. The antennæ usually end in a club with a pointed recurved tip. In coloring they are generally dark brown with spots or markings of yellow or yellowish-brown. The sexes are generally separated without difficulty by the males having a strongly marked oblique brown stripe on the forward wings. These insects abound in the fields and meadows, being particularly plentiful along flowing streams where the sweets of various kinds of wild flowers tempt them to remain. In walking through the rank grasses and weeds beside a brook or pond, one may find dozens of them in June, July and August, and a large number of species may be taken in such localities. A good many will be ruined in the net, however, as they move their wings so rapidly when captured that often only the torn fragments of them remain when taken out. When disturbed they fly rapidly with a jerking motion, and again alight after moving but a few feet. A good many of them fall a

prey to a yellowish-white spider, which hides among the blossoms ever ready for its unsuspecting victims, and clutches the insect suddenly in its powerful fore legs as it works intent upon extracting honey. One may often procure fine specimens by robbing the spiders, for they do not seem to injure the appearance of the insects. The eggs of these insects are frequently pale green, of a high convex shape above and flattened beneath, the surface being often corrugated or ribbed. The larvæ of the *Pamphila* are of various subdued colors, often being pale green and are sometimes slightly downy. They feed upon grasses. The larvæ of a great many species are still unknown.

But a few of the more common species can be illustrated in this work, as very careful descriptions and many illustrations would be necessary to enable the beginner to separate the species of insects often so closely resembling each other.



Pamphila delaware.

Pamphila delaware is common throughout the eastern half of the country. The predominating color is brownish-yellow. The body is



Pamphila mystic.

dark brown, thickly covered with yellowish hairs. The fore wings have a wide band of dark brown on the outer margin, with a brown-

ish shade next the body. The lower wings are surrounded by a heavy border of dark brown.

In *Pamphila mystic*, the body is dark brown, covered with yellowish hairs. The wings are reddish or brownish-yellow, with wide margins of dark brown. The dark brown markings extend along the veins across the yellowish portion, throwing them into relief. This butterfly inhabits the northeastern part of the United States.



Pamphila leonardus.

Pamphila leonardus inhabits the eastern part of the country, both north and south. It is a strongly marked insect, and is more easily distinguished than many of the other species which are frequently exceedingly difficult to separate. The predominating color is dark brown, with a number of clearly cut yellowish spots, their shape and distribution being clearly shown in the figure. The under side is reddish-brown, and much lighter than the upper side. The yellow spots show on both sides of the wings.



Pamphila peckius.

A very common insect belonging to this genus, and found throughout the eastern half of the continent, is *Pamphila peckius*. The coloring is brown, with a yellowish cast, and a number of dull yellow spots and markings adorn both sets of wings. In the male

insect the oblique markings on the forward wings are black, and very strongly defined. June and July are the months for the appearance of this butterfly.

The largest species of the genus found in this country, *Pamphila ethlius*, is two inches in expanse, and blackish-brown in color, with numerous square and diamond shaped translucent whitish spots. It is said to be common in the southern states, particularly along the Gulf, and occasionally strays even as far north as New York. I am not fortunate enough to possess a specimen of this insect.

A number of skippers having antennæ with spindle-shaped ends, and the ground-color of the wings brown, checkered with white spots, belong to the genus *Pyrgus*.

Most of the species belong to the western fauna. They are easily recognized, being quite different in general appearance from the rest of our native skippers.



Pyrgus tessellata.

In the hot summer *Pyrgus tessellata* is a common insect throughout the middle west and south. I have collected specimens in Iowa and Arkansas, but in my experience it is rare in New England, although occasionally taken. This butterfly loves to flit about the grass and weeds in fields and meadows, and is particularly partial to the cleared land along rivers and small streams. It is a rapid flyer for so small an insect and is rather shy. Its colors usually harmonize in a surprising manner with the surrounding dry and dusty vegetation, for it is in July and August that it is most abundant, when through the lack of rain everything in the fields is an uninteresting grayish-brown. It frequently alights on the ground, and with its wings half-spread is not a conspicuous object. The ground-color of its wings is dark brown, the lower half of the upper wings and the inner half of the lower pair being streaked with gray hairs. A number of large and small white spots are scattered over both sets of

wings, arranged as shown in the illustration. The body is slate-brown, thinly covered with gray hairs. The under side of the wings is much lighter than the upper being light yellowish-brown in irregular bars on a white ground.

There is, perhaps, greater variety both in regard to shape and coloring to be found among the different species of the genus *Eudamus* than in any of the other genera of the family. Many of our native species are comparatively large, measuring from one and one-half to two or more inches across the expanded wings. In this genera the antennæ are bent into an acutely pointed hook. One of the largest,



Eudamus proteus.

and also one of the most attractive, of our native species is *Eudamus proteus*. This insect is two inches or more in expanse, the lower pair of wings being prolonged into tails somewhat resembling the Papilios. The upper wings are dark brown, with a number of light yellowish, translucent spots arranged in two vague rows on the outer half of the wing.

The lower wings are also brown, covered on the inner half next the body with metallic-green hairs which, when the insect is alive and moving about in the sunshine, flash brilliant green. The outer edges of both sets of wings are fringed with yellowish-brown, interrupted with black dots. The body is dark brown, clothed with green hairs. The under side of the insect is brown, mottled with darker brown. The yellowish spots are seen from below, but are less sharply

defined. This butterfly inhabits the southern states, and is sometimes seen as far north as New York. It is a common insect in Florida, the larva feeding on various garden plants, such as beans, peas, cabbages, etc., and often doing considerable damage.

We may often find on the locust trees the nests of the larvæ of our beautiful *Eudamus tityrus*. These caterpillars, although often quite common, are solitary in their habits, each one making its separate cell in which it resides during the daytime, coming forth to feed at night. The caterpillar is light green, banded across with lines of darker green, having a reddish-brown head, with two large yellow spots placed where one would expect the eyes to be. These, with the monstrous size of the head, give the creature a very peculiar appearance. When full grown, the caterpillar spins a thin, silken cocoon, usually in a curled leaf, and attaching itself by the tail, with a thread of silk about its body, undergoes its transformations. The butterfly comes forth in June and July, and is to be found about flowering shrubs and weeds in open country, being seldom seen in forests. Along brooks or the borders of ponds are favorite haunts of this butterfly. It is a rapid flyer, and is somewhat shy, although one may approach it closely if care be taken. I have in mind one locality near Lebanon, Ohio, where along the banks of a brook this insect was very abundant, every bunch of flowering weeds having its occupants, the bright, silvery spot on the under side of the lower wings glistening as they moved about in the sunlight. This butterfly has a very wide range, being found over nearly all portions of the United States.



Eudamus lycidas. Upper side.

Another insect, closely resembling the preceding both in size and the coloring of the upper surface, is *Eudamus lycidas*. It is a little



Upper Side



Under Side

EUDAMUS TITYRUS

smaller than *Eudamus tityrus*. The general color is dark brown, with a number of angular, translucent, yellowish spots on the fore wings. The fringe along the outer edge of the fore wings is yellowish-brown, interrupted with black dots, that of the lower wings being gray with black points. The body is brown. The lower side of the



Eudamus lycidas. Under side.

butterfly is in strong contrast with the upper. The upper wings are mottled brown, lighter toward their lower margin, with a large black patch occupying the upper part of the wing next the body. A large, single yellow spot takes the place of the yellow spots seen from the upper side. The lower wings have a large black area, bordered



Eudamus pylades.

above and below with brown, and enclosing two or three brown spots. This occupies the upper half of the wing next the body. A patch of brown, fringed with black, occurs at the lower angle, the rest of the wing being white, streaked with fine brown markings, thickest toward the upper part. The brown of the lower wings is streaked

with darker brown. The body below is almost black, and the palpi are gray. The habits of this insect are very like those of *Eudamus tityrus*, but according to my experience, it is a much rarer butterfly. I have never seen it abundant, although I have specimens from Massachusetts, Washington, D. C., and Arkansas.

Eudamus pylades is a sooty brown butterfly, with a number of small angular light spots distributed over the outer half of the forward wing. The body is darker brown than the wings. The larva feeds on clover, and the perfect insect comes forth in June. It is an inhabitant of all but the most northern part of the United States.



Eudamus bathylus.

Eudamus bathylus is a very similar insect in color and shape to the preceding, except that the yellow spots on the fore wings are much larger and more distinct. It is more southern in its range of territory. I have specimens from Virginia and Arkansas.



Ancyloxypha numitor.

A little species, belonging to this same family, but differing much in shape from those already described, is *Ancyloxypha numitor*. In this butterfly the head is wide and large, proportionally, but the

thorax tapers backward, and the abdomen is thin and long, contrasting greatly with most of the skippers. The antennæ are knobbed but not pointed. The upper wings are yellowish-brown with a wide black margin. The lower wings are lighter or tan color with a heavy black border extending along the upper margin around to the inner angle and are fringed with yellow. This is a very common butterfly in August over the eastern half of the United States. It is fond of open fields, and the second crop of clover is a favorite with it.

LYCÆNIDÆ.

Blues, Coppers, Hairstreaks.

A large number of frail but lovely little creatures comprise the great family *Lycænideæ*. Most of the species belonging to this family are small, our largest being about two inches in expanse of wing. The antennæ are knobbed or clubbed, but not pointed as in the family of *Hesperidæ*, and the knob is straight. The wings are frequently delicate in structure and are large and flat in proportion to the body, which is slender. The thorax in a few species is robust but is generally slight. All six legs are well developed and are used in walking. The family is a very large one and insects belonging to it are to be found in almost every land. The beauty of some of the species is most extraordinary, comprising almost every conceivable color and shade. Many of them are metallic blue, while others are green, purple, red or golden, and some a combination of these. A number bear on the lower wings curiously shaped tails. Were these slight butterflies of large size some of them would rival the gorgeous *Morphos* and the regal *Papilios* and *Ornithopteras*. They are to my mind among the handsomest objects in nature. Some of them haunt open grassy fields and meadows, others delight in low shrubbery on the outskirts of forests, and still others prefer the woods and will often congregate in numbers in sunny open spaces among the trees. The flight of some, especially the more delicate, is slow and unsteady, while others are swift flyers; but their flight is not usually long sustained. Their flight is generally low, and consequently they are easily taken with the net. When they alight their wings are most often closed tightly together over the back, and some have a habit while at rest on a leaf or flower of working each of the lower pair of wings alternately up and down. This habit, strange as it

may seem, has gone round the world, and when one is collecting perhaps on the other side of the globe he will see species allied to those so well known in his native land, as they alight on the tropical foliage go through the same antics. One is apt to exclaim, "Dear me! where did that little butterfly learn that trick?" A fact like this is very likely to set one wondering how such a habit is transmitted and also why it should be so persistent in travelling so far.

The larvæ of these butterflies are interesting from the fact that they are slug-like in their form and movements, their abdominal legs



Larva of *Lycaena*.

being so short that they cling very closely to their support and glide rather than crawl. In this respect they resemble the larvæ of *Limacodes* among the Bombyx moths. They also somewhat resemble wood-lice, the head being small and capable of being retracted beneath the folds of the first thoracic segments. The body is not adorned with tubercles and filaments as in most of the larvæ of *Limacodes*. Some of the species are said by Professor Comstock to possess honey tubes through which honey dew is extracted for the use of ants. Many of the caterpillars are green in color and feed on the leaves of forest trees, oak being a favorite food plant. One of our native species is carnivorous in the caterpillar stage and feeds on plant-lice. A few of the larvæ are downy, but they are usually naked. The chrysalis is short, broad and thick and is convex on the back, rounded at both ends and flat beneath. It is attached by the tail to a silken mat and has a band of silk about the middle, holding it closely to the substance to which it is fastened. The *Lycaenidae* may be readily separated into three groups, the "Blues," including many blue, purplish and bluish-brown insects; the "Coppers," in which many of the species are copper-red or brownish-red; and the "Hairstreaks," wherein a large number bear tails and are of various colors, often ornamented with fine streaks of color beneath. The United States are rich in insects belonging to this family, the mountain regions of the Pacific coast being particularly so; while some of the most beautiful inhabit the valleys and table-lands of Colorado, Arizona and New Mexico.

LYCENA. *Blues.*

The "blues," or the genus *Lycena*, is well represented in this country, but the bulk of the species inhabit the Pacific coast where a large number of the finest insects of this genus are to be found. These butterflies are frail, delicate creatures, the body being weak, the wings large and wide in proportion. The coloring of the upper side of the wings in most species is satiny blue, others being bluish-purple and purple-brown. The under side is generally light gray with more or less distinct brown or blackish markings. There are about fifty species of these butterflies inhabiting the United States, but only a few of them occur east of the Rocky Mountains. To one who has collected in New England or the western states the number of species and individuals of this group to be seen in the mountain valleys of Nevada and California is something long to be remembered with delight. They are most abundant in the spring and early summer, when the valleys are bright with wild flowers and before the long and severe summer drouth has turned the fertile land into a brown and barren desert. Near Washoe, Nevada, at the eastern base of the Sierra Nevada, my brother one season made an extensive collection of species of this genus and the *Chrysothanas* and *Thecla*. They are very plentiful in the Yosemite valley in June, and at that time the wild flowers are peopled with them. We have but two common species of this genus in the east, although two or three others occur rarely in the middle states and several in Florida.

Lycena pseudargiolus is our best-known species, as it is everywhere abundant in early spring, and is on the wing soon after the snow disappears from the woods. This insect has many well-marked varieties, some eight or ten of which have been described and named, entomologists supposing them to be distinct species. A remarkable thing about these varieties lies in the fact that they are frequently local, having boundaries as distinct as well-marked species, and while the insect in general inhabits a large part the United States and Canada, extending also up into Alaska, certain varieties are often much more restricted. Another curious fact connected with this and several other kinds of butterflies is that the insects emerging from chrysalides which have hibernated over winter are different from their parents, which were the summer brood of the year before. Without going too much into details two or three of the well-marked varieties will be given with descriptions.]

In the early spring form, probably most numerous throughout the country, the upper side of the male (Fig. 1) is a rich satiny or azure



Lycaena pseudargiolus.

Fig. 1. Male.

blue, deepest near the base of all four wings. The upper wings are margined outwardly with a narrow shading of blackish, widest and heaviest at the apex of the wing. The lower wings are edged on their outer margin with a narrow, dark line. Both pairs of wings are fringed with gray, darker toward the apex of the upper wings, and interrupted on both wings with black dots. The body is black. Insects with these colors above have at least three varieties



Lycaena pseudargiolus. Under side.

Fig. 2. Male.

where the colors beneath differ. Fig. 2 is light gray beneath, having a row of light brown dots along the outer margin of all four wings enclosed on the inner side with a scalloped line of the same color. An irregular row of dark brown spots cross the upper wings near their outer margin, the remainder being plain gray, slightly darker along the upper margin. A number of black spots are scattered over the lower wings. The thorax is light gray, the abdomen nearly white. In Fig. 3 the under side is bluish-gray, darker than Fig. 2.

The spots on the outer margin of the wings are very faint, fading out on the upper wings, and outside the scalloped line is a band of brown-



Lycaena pseudargiolus. Under side.
Fig. 3. Male.

ish-gray lighter toward the apex of the upper wings. The row of spots on the upper and the scattered spots on the lower wings are not so sharply defined, but are larger than in Fig. 2. The thorax



Lycaena pseudargiolus. Under side.
Fig. 4. Male.

is darker gray and the abdomen is white. Fig. 4 is still stronger marked; the gray is a little darker than in Fig. 3. Outside the scalloped line along the outer margin of the wings is a wide band of brown enclosing black spots on the lower wings. The row of spots on the upper wings are heavy and make a continuous line. On the lower wings the scattered spots have widened until they have coalesced, making a large patch of brown on the middle of the wing. The thorax is dark gray, the abdomen white. The typical female form is shown in Fig. 5. The wings are satiny blue, somewhat darker than in the male. Along the outer margin and extending half-way along the upper edge of the upper wing is a wide band of black, strongest at the apex. The upper edge next the body is

light gray. The lower wings are fringed with white interrupted with black spots. Along the outer margin is a row of small black



Lycaena pseudargiolus.
Fig. 5. Female.

spots. The thorax is black, the abdomen dark gray. The under side of the female is shown in Fig. 6. The wings are gray, darkest



Lycaena pseudargiolus. Under side.
Fig. 6. Female.

next the body. Heavy blackish spots adorn the wings and a wide border of blackish-brown scalloped on the inside follows the outer margins. The specimens described and figured were all taken early in the season near my home.

A specimen from Haverhill, Massachusetts, is somewhat larger than those first described. It is like the ordinary variety above except that the lower wings have a large very light area in the middle. Beneath, it is very light gray with small distinct lines and spots. A variety sent me from near Toronto, Ont., is large and beautiful. In the male insect (Fig. 7) the upper side of the wings is rich shining purple with a narrow line of black edging the outer margin of all four wings. Outside of this is an uninterrupted white fringe. The body is bluish-gray. The under side (Fig. 8) is a much darker gray

than those already described. There is a row of shining blue spots along the outer margin of the lower wings, and above these a band of



Lycæna pseudargiolus.
Fig. 7. Male.

ochre edged internally with a line of black crescents. The other spots on the wing are black, except a double row along the outer



Lycæna pseudargiolus. Under side.
Fig. 8. Male.

margin of the fore wings which are dark gray. These spots are all edged with light gray. The female of this variety (Fig. 9) is very



Lycæna pseudargiolus.
Fig. 9. Female.

different from those already mentioned, being dark brown with a purplish area on the lower half of the upper wings, the same purple

extending in a band, widening as it crosses the lower wing from the base to the lower margin, where it occupies nearly the whole width of the wing. A row of black spots extends along the lower margin of the lower wings, partly enclosed on their inner sides with orange-colored half-moon spots, which fade out as they approach the upper margin. A narrow black line extends along the outer margin of the upper wings and is continued along the lower margin of the lower pair. Both sets of wings are fringed with gray scales. The body is black.

These little butterflies are slow flyers, keeping not far above the ground, and are usually most abundant on the outskirts of woods. They love to congregate about damp places on the ground to sip the moisture. With care one may approach closely and even take them by hand. The coloring of the male when freshly hatched is very pleasing and is almost the exact tint of the horseshoe violet which blooms at the time when this butterfly is most numerous, the flowers and insects being often found near one another. There are two or more broods of these butterflies in a season. The larva is usually light green with brown markings, but pinkish or chocolate-brown specimens sometimes occur. It feeds on the buds and flowers of several plants, dogwood and rattle-weed being favorites. The chrysalis is brown with two rows of brown dots down the back of the abdomen.



Lycaena comyntas. Male.

One other common species of this genus is *Lycaena comyntas*. The male is dark violet, the upper wings with a narrow band of blackish-brown along their outer margin, the upper and lower margin of the lower wings being the same color. The lower wing has a black thread-like tail with a white tip. This will readily distinguish it from the preceding tailless species regardless of the varieties it may assume. Along the lower margin of the lower wing is a row of black

spots, the largest one just above the base of the tail having an orange crescent above it. These black spots are outlined on the outer side with a faint white line. The thorax is bluish-black, the abdomen



Lycæna comyntas. Under side.

brown. The under side which is similar in both sexes, is very light gray. A number of dark gray dots are arranged in rows on the outer third of the upper wings, and a row extends along the lower margin of the lower wings, the two nearest the lower angle being partly enclosed with orange crescents. Other spots of gray are scattered over the wings, and most of them on both wings are outlined with white. The legs and thorax are light gray and the abdomen white. The



Lycæna comyntas. Female

female of this species is blackish-brown with purple reflections in a strong light. A faint white line extends along the lower margin of the lower wings and two distinct black spots are located above near the base of the tail. The spots are partly surrounded above with two crescents. The body is black.

This tiny butterfly makes its appearance in the latter part of July and the first of August, and is usually to be met with in abundance about forest clearings or bushy pastures. It is a weak little creature, seldom flying more than a few feet at a time. It is very fond of the

flowers which bloom at the time of year it makes its appearance, and is often so interested in its repast that it may be collected by hand. Mr. Harris says that the caterpillars live on *Lespedeza*, and that they are oval, convex and downy, of a pale green color with three dark green lines, the sides of the body reddish and the head black. The chrysalis, which is usually fastened to a leaf, is at first pale green, but becomes darker afterwards. It is sparingly clothed with whitish hairs and there are three rows of black dots on the back. The chrysalis state lasts from nine to eleven days. This butterfly is found in nearly all parts of the United States.

CHRYSOPHANUS. *Coppers.*

The insects belonging to this genus can generally be separated from the other members of the family by the copper-red, orange-red or brownish-red colors of most of them. Conspicuous brown or black spots usually adorn the wings, both upper and under side. Our most numerous species of these little butterflies inhabit open fields and meadows and are sometimes exceedingly abundant. Our most common butterfly of this genus and probably the most common butterfly to be found in New England and the middle states during May and again in August is *Chrysophanus hypoplæas*. It is very partial to open fields where buttercups and sorrel abound, and the blossoms are literally alive with this pretty little insect during its greatest abundance. At evening they alight on the stems of grasses and weeds with their wings tightly closed, and one may go about after sunset or early in the morning and pick them off with the fingers. During the cool morning while the grass is covered with dew they remain quietly suspended from the stems and leaves of plants and will not readily take wing. One advantage of this mode of collecting is that one need take only perfect specimens, and those taken if put at once into papers are not liable to be injured. Two or three different varieties of this butterfly are to be found by diligent search. In one the black spots of the forward wings are almost or wholly wanting. This variety has been taken in some numbers about Cambridge, Massachusetts. In contrast with this is a dark variety, where the black spots of the upper wings are very much widened and elongated beyond the normal, covering a good part of their surface.

These varieties are not numerous, but one may find them by collecting large numbers of specimens. In five hundred specimens of



Upper Side



Under Side

CHRYSOPHANUS HYPOPHLEAS

this species collected in Wellesley, Massachusetts, during May of 1897, I took no very striking varieties of any kind, but in the same year during August I collected five hundred more, with the result of obtaining half-a-dozen well-marked specimens of the dark variety, but not one of the light. Whether this is a sufficient number to give an idea of the percentage of such variations I cannot say, but one would infer from this that the second brood is much more liable to



Chrysophanus hypoplæas, var.

variation than the first, and that the light variety with almost no spots is of much rarer occurrence than the dark variety. In some of the dark variety the black almost covers the entire wing, making the insect look like a totally different species. The caterpillar of this butterfly is longer and narrower than is usual with the larva of butterflies of this family, is covered with hairs, is reddish, pinkish or greenish in color and feeds on the common sorrel. The chrysalis is short and stumpy, like that of most of the species of the family.

Mr. Packard says of the chrysalis: "The head and thorax, including the wings, is dull reddish-brown dotted with black. The abdomen is much lighter with very distinct and irregular black dots. The chrysalis is usually suspended under a stone." There are two or more broods in a season. The geographical range of the species is wide, being found along the Atlantic coast southward, throughout the middle states and through Canada, west into Washington and in California. A very closely allied if not the same species occurs throughout Europe.

Our largest and handsomest species of this genus is *Chrysophanus thoe*, and an exceedingly fine butterfly it is, an ornament to any cabinet. The insect expands from an inch and a half to two inches or more, the female being usually somewhat larger than the male.

The upper wings of the male are a beautiful bronze-brown, having

a purplish or pinkish sheen overspreading them, strongest toward the outer margin, with a brassy look nearest the body. Along the mar-



Chrysophanus thoe. Male.

gin is a band of dark brown, and several spots adorn the middle of the wing, varying in intensity from black to a very faint brown. Two rows of faint brown spots cross the wing on its outer portion. The lower wings are darker than the upper pair, the purple reflections extending over the upper half only. The wings are scalloped along their lower edges, the points and margin being black, while between these black points is a white fringe. Above the black margin and connected with it is a row of roundish black spots, the one nearest the lower angle of the wing being double. Above this



Chrysophanus thoe. Under side.

row of spots and partly enclosing them is a band of orange, widest near the angle and narrowing to crescent spots at the top. A single almost black line is placed above the centre of the wing. The body is black, the antennæ are black tipped with orange, and like many of the species of this family, they are crossed by numerous fine white

lines. The under side is much lighter than the upper. The upper wings are light rust-red, still lighter toward the lower margin with gray fringes and a light gray area at the apex extending half-way down the outer margin. In this gray area are fine, nearly white spots. Numerous black spots are scattered over the wing. The lower wings are light gray, nearly white along their inner margin. Along the outer margin is a black line bearing black points. A wide orange band occupies the lower part of the wing and many black spots outlined with white or very light gray look as if scattered at random over the wing. The body, legs and palpi are white. The female differs from the male in having a large, dull orange spot occupying the middle of the upper wing, which has a wide blackish-



Chrysophanus thoe. Female.

brown margin, the rest of the wing being brown without the purple reflections. The spots on the wings are large and black. The lower wings and the under side of both wings much resemble those of the male insect. Although I have never seen this butterfly at all numerous in comparison with the preceding species, it is not rare in the middle and western states. It is usually to be found on bushy or weedy tracts, especially along rivers or railroad embankments. It frequently alights on the low weeds which spring up on the sandy bars covered by high water, and here it may be seen in July or August days, resting with the wings half-spread or chasing other insects about in the hot sunshine. It is not very shy nor a swift flyer, so that one may often take it with the net while on the wing. When disturbed it flies but a short distance, and alighting closes its wings, remaining motionless to escape observation. The larva feeds on dock and there are two broods in a season, one usually in May

and the other in August. This insect ranges from New England, where it is rare, through the middle and western states to the Rocky Mountains.

The habitat of a certain insect is sometimes so restricted and its favorite haunts so few and far between that one may dwell within no great distance of it for a long time without knowing of its existence. Many of the tiny creatures such as we are considering are shy and retiring, shunning man and his habitations and never intruding themselves upon his notice. A good many of the butterflies belonging to this great family of *Lycenide* have to be carefully and diligently searched for, and a collection containing a large number of our native species carefully collected and neatly mounted represents a good deal of painstaking labor both in the field and in one's home. Our next example, *Chrysophanus epixanthe*, is such a little creature, its colors blend so readily with its surroundings and its habitat is so restricted that it has been considered by some collectors a rare insect. It delights in low swampy districts where grasses, cranberry vines and low bushes cover the ground, and in a swamp perhaps many acres in extent, one part apparently like another, it may be confined to a few square rods of grassy and bushy water-soaked land. Such a locality I know not far from my home, where, early in July, one may go with



Feniseca tarquinius.

the prospect of finding this little butterfly moderately abundant. It is difficult to see when at rest on a grass stem as the color of the under side of the wings, which are usually closed, is about the same as that of the yellow, dried stems and leaves of the previous season's growth. The butterfly is not shy and its flight is slow and weak. When disturbed it rises but a few inches above the grasses and flying a few feet alights. When freshly hatched from the chrysalis the rich iridescent brownish-purple of the upper side of the wings makes it a

beautiful little creature. I have never found well-marked varieties of this species such as occur in *Chrysophanus hypophleas*. This butterfly is found throughout New England and the western states.

A remarkably interesting though usually rare butterfly is *Fenisea tarquinius*. The upper wings are heavily bordered with black with a wide, irregular orange patch containing two black spots occupying their central portion. The upper half of the lower wings is black, the lower half orange with a row of irregular black spots along the lower margin. The body is blackish-brown. The under side is very differ-



Fenisea tarquinius. Under side.

ent in coloring. The upper wings above their upper and outer margins have a wide band of light rusty-brown. The lower margin of the wings is gray, while the interior portion is light orange. Four angular dark reddish-brown spots, very small next the body and growing larger toward the apex of the wing, are placed along the upper margin. Two black spots and a line running toward the base of the wing occur farther down. The lower wings are reddish-brown, lighter toward the lower margin, and almost the whole surface is covered with reddish-brown spots edged with gray. The markings vary somewhat in different specimens, sometimes the black and again the orange predominating. The body and legs are light gray. Although this insect inhabits almost the whole country east of the Rocky Mountains I have never seen it abundant. I once took a dozen or fifteen specimens early in June along the road leading from Jackson, New Hampshire, to Mount Washington. They were at rest near puddles of water in the road, and one or two were settled on horse dung. I found them exceedingly shy and very rapid on the wing. Their colors are such that unless one kept his eye constantly on the alert he would scarcely see one at all, much less catch one in a net while on the wing. When disturbed they would fly into

the woods high up among the branches of the trees and would soon be lost to view. I found by walking very slowly over the road and carefully scanning every wet place and every heap of dung, I could see these shy, alert creatures before they became frightened and took wing, and in this way procured a good number. Sometimes while I was approaching stealthily what looked like a tiny line of brown on the road a butterfly of some other kind would sail past and away would go my intended prize after the new comer, chasing him perhaps several rods down the road. I found if I remained standing quietly by he was very likely to return soon. The place where these butterflies were to be seen did not occupy over a quarter of a mile of the road, and I found them in the same place when returning from the mountain a week later. The most interesting thing in connection with this butterfly is that the larva is carnivorous (a very unusual thing among the *Lepidoptera*) and feeds on the colonies of woolly plant-lice inhabiting the alder. The larva, according to French, is green with three white stripes down the back. Besides the specimens mentioned taken in New Hampshire, I have one from Wellesley, Massachusetts, and two from Gainesville, Virginia.

THECLA. *Hairstreaks.*

The large genus *Thecla*, the "Hairstreaks," next engages our attention and in the eastern half of our country is well represented. While we have no members of this genus to equal in coloring some of the resplendent creatures which inhabit the hot valleys of the Andes or rival many from Mexico or Central America, still we have a number that are both interesting and beautiful. Many of the species of this genus have one or more delicate prolongations or tails to the lower wings. These in some of the tropical insects of this group are long and curved and add much to the beauty and oddity of the specimens. The males usually have a dark oval patch of color near the upper margin of the upper wings. This is generally quite distinct and easily seen. Most of our native species are of different shades of brown with fine lines and markings beneath and with bright patches of color, strongest on the under side near the inner angle of the lower wings. In some species the thorax is strong and stout, furnishing powerful muscles to work the usually short wings. Many of these insects are swift flyers although they do not generally make long flights. They are usually most abundant on the edges of forests,



UPPER SIDE



UNDER SIDE

GHRYSOPHANUS EPIXANTHE

and the sweet-smelling flowers to be found in such localities are a great attraction to them. About twenty species are native of the eastern half of our country.



Thecla halesus.

One of our most gorgeous insects belonging to this genus is *Thecla halesus*, and when gazing on its rich and brilliantly colored wings, one can hardly believe it is other than an inhabitant of tropical countries.

It is rather stout-bodied. The upper wings of the male are intense shining blue changing to purple or greenish according to the light in which it is held, with a heavy black band extending along the outer margin and for a short distance along the upper margin near the tip of the wing. A large black sex mark is located just below the middle of the upper edge of the wing. The lower wings are also blue, with a wide black patch at the upper angle and a wide band of black shading into greenish gray towards its upper part, on the inner margin. There is one long pointed tail on each of the lower wings, with a very short one scarcely more than a point just above it. Near the base of the long tail is a shining metallic greenish spot changing to bronze toward its inner end, and also a little spot of the same color near the base of the little tail. The head is black, with three silvery dots above and two silvery lines along the base of the palpi. The antennæ are of the same color; the body a brilliant shining blue shading to black toward the tip of the abdomen.

The female is usually larger than the male, and much more sombre in coloring. The most striking difference, however, is in the tails or delicate prolongation of the lower wings. The upper pair are of moderate length, and about what one would expect in a butterfly of

this size. The lower pair however, are very long and slender, and out of all proportion to the size of the wings. On this account, and the size of the insect, none other of our native butterflies are at all



Thecla halesus. Female.

likely to be confused with this species. The upper wings are sooty black on the outer two-thirds of their area, the inner third being a dull metallic greenish blue, blending into the black. This coloring also extends diagonally across the lower wing from the body to near the base of the tails. Two elongated blue spots and one nearly round bronze spot are enclosed in a black area near the base of the tails. The tails are black.



Thecla halesus. Female. Under side.

The under side of the wings of both sexes is much alike. The upper are brown, slightly lighter on the lower half, with two white dots and one orange red spot near the base of the wing. A black

fringe extends along the outer margin. The lower wings are slightly darker brown than the upper pair, sometimes having a delicate violet tinge on the upper portion. Near the base of the wing are several white dots and two orange red spots. An area about the lower angle of the wing is black, and the tails and the fringe along the outer margin are also black. A row of metallic violet or purple blue spots extends along the lower margin of the wing, just inside of the black fringe and above the base of the tails. Two rows of shining green spots, the lower row ending in a long spot of bluish purple next the inner margin, extend nearly across the wing in its lower portion and separate the brown from the black area. The head, thorax and legs are black with numerous fine white dots, and the abdomen is orange red tipped with black.

This handsome butterfly is an inhabitant of the southern states and Mexico. It is occasionally taken as far north as southern Ohio and Illinois, and westward in California. It is not a rare insect in Florida early in March, my brother having seen and taken specimens near Jacksonville in that month. It is a strong and rapid flyer, frequently alighting, but rather shy, and difficult to take with the net. In Florida it is to be found in sandy districts on the edges of forests. It frequently circles about the trees and when frightened flies up and alights on twigs high up out of reach. I have several fine specimens from Tennessee which are at least a third larger than those taken by my brother in Florida. It is from these Tennessee specimens that the illustrations are made.

The larva I have never seen and know nothing of its habits. It is said to feed on the leaves of the oak.



Thecla smilacis.

A rather rare *Thecla*, and one which differs in a striking manner from our other native species, is *Thecla smilacis*. It is a double-tailed species, the upper pair of prolongations being exceedingly fine

and hair-like, and showing at a casual glance scarcely more than a point. The lower tails are larger and longer. There is some difference in coloring between the sexes, the female being usually plain brown in color, while in the male the middle of each wing is tawny or rusty with a border of dark brown. The tails are black, tipped with white, and the body is dark brown; but the distinguishing characteristic is the color of the under side, which in both sexes



Thecla smilacis. Under side.

is green. In the upper wings the green color is most intense near their base and at the tip, the lower half of the wing being rusty brown. Two rows of white dots, internally edged with reddish brown, cross the upper wings, fading out toward the lower margin of the wing. The lower wings have three bands of white, the inner one next the body being short and composed of three white spots edged externally with rusty brown; the middle one extends in a wavy line across the centre of the wing, and is composed of large white spots, having spots of rusty brown on the inner side; the outer band is narrow and follows the outer margin of the wing, being edged internally with gray and externally with dark brown. A small black spot is located at the end of this line, just at the inner angle of the wing, and has a white crescent above it. Between the outer and middle white lines are two very small crescents of black, the lower one having a faint orange spot below it with a black dot below that. The body and legs are gray. I have never seen this insect at all abundant and have taken it on but two or three occasions near my home in Massachusetts. It is a difficult little creature to see when at rest on the shrubs and bushes, among which it delights, and when disturbed it flies in such a rapid and jerky manner that the eye can scarcely follow it. I have taken it early in June flying about scrub oaks and young cedars, and am inclined to think the larva lives on the latter plant, although

I have never been so fortunate as to find it. The species inhabits most of the country east of the Rocky Mountains and south of Massachusetts.

A very delicately and prettily marked little butterfly is *Thecla pœas*, an inhabitant of the southern and southwestern states. The upper wings are sooty black, with no markings whatever in the ordinary form except that the upper edge of the wing is red, although a specimen is occasionally taken with a few blue scales



Thecla pœas.

scattered near the base of the wings. The lower wings are also black, with a conspicuous wedge-shaped blue patch extending from the base to near the lower margin, widening as it advances. Two black spots are located near the base of the tails, with a fine grayish blue line below them. In this species, as in most of the butterflies of this genus, the lower pair of tails is the larger. Both pairs are



Thecla pœas. Under side.

black, tipped with white. The body is black. The under wings are grayish brown, lighter toward the lower margin of the upper wings, the red upper edge of the upper margin showing more distinctly from below. A reddish orange band composed of nearly square spots placed close together extends two-thirds across the upper wings, beginning at the outer third of the upper margin. This

band is edged externally with a very narrow line of black, and outside this is another line of white. A line of faint dark spots fading out toward the upper margin may be traced between the strongly colored orange band and the margin, and a single elongated spot is located above the centre of the wing. On the lower wings the band of reddish orange spots, similar to the one on the upper wings, extends in a zigzag manner across the wing. Between the base of the tails is a large black spot with an orange crescent above it. A small black spot with two vague white spots above it is located at the inner angle, and between this and the large one is a blue gray spot. A fine black line extends along the lower margin with a delicate white line above it. There is also a line of faint dark crescents, the lower one having an orange line externally, extending from the large black spot to the upper angle of the lower wing. The thorax and legs are gray, the abdomen whitish.

In Florida and the Gulf states, this butterfly is generally not rare in February and March, and may be taken in the same localities inhabited by *Thecla halesus*. It is not wild and may be captured in the hands if caution is exercised. When frightened, however, it can fly rapidly, but after circling about for a few moments soon alights, often returning to the spot which it occupied before it was disturbed.



Thecla calanus.

Probably our most common species of this genus is *Thecla calanus*, and although I have never seen it in any such numbers as one may often see species of our commoner butterflies, still in favored localities it is sometimes abundant. The upper side of the wings is dark blackish brown, the male having the usual oval disc near the upper margin. There is one moderately long tail and an exceedingly fine and short one. Both are black and tipped with white. Near the base of the tails, and extending to the inner

angle of the wing, is a narrow black line edged on both sides with a faint white line. There is a black spot at the inner angle, and a dim orange red spot edged externally with black above and between the base of the tails. The body is of the same color as the wings.

The under side of the wing is lighter than the upper. Two lines of elongated dark brown spots, close together, cross the upper wing. The outer line is very faint, both above and below the middle, edged internally with white; the inner line is more distinct, and is edged externally with a fine line of white. One dark brown spot is situated above the middle of the wing, and is edged



Thecla calanus. Under side.

on both sides with faint whitish lines. On the lower wings the two lines of spots are continued, but the outer one is much more distinct than the inner, being composed of black crescents edged internally with white. This line is very irregular and runs in a zigzag manner above the base of the tails. The inner line is edged externally with white, as on the upper wing, both lines curving upward toward the end of the abdomen on the inner margin. There is a conspicuous black spot between the base of the tails and another at the inner angle. A fine white line runs from the latter spot along the outer margin and fades out toward the upper angle. A large blue gray spot is placed between the two black spots. A large deep orange crescent with a smaller one placed farther upon the wing will be seen above the first black spot, and an orange line is located above the black spot at the inner angle. The thorax and legs are blue gray, and the abdomen is whitish with brown at the tip.

In the latter part of June and early July this butterfly makes its appearance in the northern part of this country. It is not at all shy or wild, and when settled on its favorite flowers may be picked off

with the fingers. Like many other insects it is very partial to the blossoms of the different kinds of milkweeds, deliberately moving about over the clusters of flowers and extracting their honey, paying not the slightest attention to the bees, wasps, beetles and flies that usually swarm about these strong-smelling blossoms. One of my brothers had the good fortune early in July to find a locality in Concord, Mass., where this and two or three other species of *Thecla* were very abundant, and where he obtained a large number in a short space of time. They were first seen on the roadside, but on entering the scrub an open space was found, of perhaps half an acre in extent, in which many plants were in bloom. On the flowers rested dozens of specimens of this and the following species, most of them in very perfect condition. Specimens of *Thecla titus* were also seen and captured, but they were very wild and had to be approached in the most careful manner. The finding of such a locality as this is a veritable mine to the collector, who may here lay in a supply of perfect specimens with which to exchange with other collectors for their duplicate specimens. One gentleman with whom I am acquainted, living not far from my home, has in this way obtained a very fine collection numbering many hundreds if not thousands of both native and exotic butterflies and moths, never having procured a specimen except in exchange.

The larva of *Thecla calanus* feeds on the oak. The species inhabits the eastern half of the country, except the extreme south. It also runs well up into Canada.



Thecla edwardsii.

A closely allied insect, inhabiting the same localities and easily mistaken for the preceding species, is *Thecla edwardsii*. This butterfly also has two tails, although the upper pair are scarcely more than points. The general color of the upper side is not so dark a brown as in *Thecla calanus*. There is the same black line along the lower margin of the lower wings, edged with white. Above and between

the base of the tails is a tawny spot, which in some specimens is prominent and in others is so dim as to be scarcely noticeable. The under side is lighter brown than the upper, the spots arranged in two rows on both sets of wings much the same as in the preceding, except that they are farther apart and the white lines encircle the brown spots on the inner row, although they are much more prominent on the outer side. Several crescents of deep orange, edged internally with black, extend from the base of the lower tail to within a short distance of the upper angle in the lower wing, and a large blue spot is located between the base of the lower tail and the inner angle, where there is a black spot.



Thecla edwardsii. Under side.

The tails are black, tipped with white, and a small black spot, with a point in the middle extending upward, is located above the base of the tails. A fine black and white line follows the lower margin of the wing from the black spot at the lower angle to the upper angle. The thorax is gray, the legs nearly white, and the abdomen light brown.

This butterfly, although usually less abundant, inhabits the same localities and may be taken at the same time as the preceding species. The remarks as already written in regard to the habits of one apply equally well to the other.

Another double-tailed species, which I have found rather rare and difficult to obtain in perfect condition, is *Thecla strigosa*. The upper side is dark brown, and in the female a large patch of tawny orange occupies the middle of each fore wing. This spot is almost if not wholly wanting in the male. A faint tawny spot with a black spot below it is placed between the base of the tails in the lower wings, and a black line edged with a faint line of white extends from the base of the upper tail to a black spot at the inner angle. The tails are black, tipped with white. The body is dark brown. The under

side is prettily marked with wavy white lines, the outer line of both wings being edged externally with black crescents. A black spot is situated on the lower wings between the base of the tails, and another



Thecla strigosa.

one at the inner angle. Between these two is the usual blue gray spot. A row of orange red crescents, gradually becoming smaller toward the upper part, extends above these spots from the inner



Thecla strigosa. Under side.

angle toward the upper angle of the wing. The thorax is gray, and the legs grayish white, the abdomen being yellowish white. Packard says that the larva is downy and of a rich velvety green, obliquely striped on the sides with faint yellow lines, and that it feeds on the thorn.

I have captured a few specimens of this butterfly in Massachusetts late in July, and have had others sent me from Canada. This insect inhabits the eastern half of the country. Those that I found were among low shrubs and bushes and often in company with *Thecla calanus*, though they were much more shy, and when alarmed flew rapidly away and were seldom seen again. The white lines on the under side render the insect quite easily identified from the other butterflies with which it is likely to be found, and one may move cautiously about where they are feeding or

sporting in the sunshine, and pick out the kinds which are most desired.

Still another of our native double-tailed insects belonging to this genus and inhabiting all the upper part of the eastern half of the country is *Thecla humuli*. The upper side is sooty brown, sometimes blackish or bluish, particularly on the lower wings. The upper wings have no marks of any kind except the usual sex mark in the males. The lower wings have two delicate tails on each, the lower pair being much the longer. These are black, tipped with white. Between the base of the tails is a black spot, and above this a large, orange red crescent. Two or three dim bluish spots are located between this orange crescent and the inner angle of the wing. A narrow black line, edged internally with a faint whitish line, runs from the base of the upper tail to near the inner angle, where there is usually a



Thecla humuli.

faint orange spot. The eyes are brown, the front part of the head white, the thorax and upper part of the abdomen bluish black, the latter tipped with reddish brown.



Thecla humuli. Under side.

The under side of the wing is a delicate light grayish brown. The upper margin of the fore wing along the inner half is tinged with red, and two lines of blackish spots are placed on the outer third of the wing. The outer line is faint, and fades out completely at

both ends before reaching the upper or lower margin; the inner line is composed of more distinct spots, and extends from the upper margin half-way across the wing, where it abruptly ends. These spots are edged externally with white. These two lines of spots cross the lower wings, approaching each other closely where they end at the inner margin. At the inner angle is a distinct black spot, and another one is placed above and between the base of the tails. Conspicuous orange spots, with a gray one between them, are located above these black spots. A narrow black line, edged internally with white, extends along the outer margin from the spot at the inner angle to the upper angle of the wing. The body and legs are light gray, almost white.

This pretty little butterfly is not rare in July and August, and may frequently be found about flowering plants at that time of year. According to my observations it is most abundant along the borders of lakes and rivers, but this is doubtless because the flowering plants from which it extracts honey are, in our cultivated districts, only allowed to grow freely in such places. The larva is green and downy, and may be found feeding on the hop vine. It is found in all parts of the country.



Thecla titus.

Thecla titus is a handsome tailless species, having a range over the country east of the Rocky Mountains, extending north into Canada. The upper surface is dark brown with brassy reflections, the body being blackish with a slightly green shade. The upper wings are without markings, except a grayish oval sex mark near the upper margin in the male. On the lower wings a fringe of white hairs extends along the inner margin from their base, half-way to the inner angle. A faint whitish line, edged internally with black, runs from the inner angle a short distance along the outer margin. On the under side the wings are somewhat lighter with more of a red-

dish cast, next the body being slightly greenish, but lacking the brassy reflections of the upper side. A row of small black spots, edged externally with gray, run more than half across the upper wing from the outer third of the upper margin. A row of three or four minute black dots are placed between this row and the outer margin. On the lower wings is a row of bold, orange red spots, edged internally first with black and then with white, extending from the upper margin near the upper angle to near the inner angle. A narrow black line runs from the inner angle along the outer margin, growing fainter toward the upper angle. A straggling row of black dots, edged outwardly with white, partly cross the wing beginning about the middle of the upper margin. The thorax is bluish gray, the legs whitish. The abdomen is yellowish white, but brown at the tip.

A more agile and wary little butterfly than this it would be difficult to find. While on the wing it moves so rapidly and darts about in such a manner, that one can hardly keep it in sight.



Thecla titus. Under side.

It is frequently to be met with in July, on flowering weeds in company with other kinds of *Thecla*, but one must move cautiously and strike quickly with the net to capture it. While in pursuit of the different species of *Argynnis* along the meadows, I have occasionally run across this butterfly, but have never seen it very abundant. French describes the larva as dull green in color and covered with very short brown hairs. It feeds on wild cherry and plum. Inhabits the greater part of the whole country, but is not very common.

A species not possessing tails, but furnished with several tooth-like projections on the lower wings, is *Thecla irus*. The body and wings on the upper side are dark brown without markings, save that on the lower wings the prolongations are tipped with black, and a

narrow black line runs from the inner angle along the outer margin to the upper angle. On the under side the inner two-thirds of the upper wings is dark reddish brown, edged externally on the upper



Thecla irus.

portion with a white line. The outer third is light reddish brown darker toward the margin, and containing a few faint dark brown spots. A band along the lower margin of the wing is grayish brown. On the lower wings next the body is an area of dark gray, with an irregular dark reddish brown patch, which commences wide at the upper margin and ends in a point at the middle of the



Thecla irus. Under side.

inner margin. The remainder of the wing is occupied by a gray area, brownish toward the upper margin, where it encloses a few vague brown spots. The projections on the wings are dark brown, and a small black spot is located above the base of the lower pair. A few brown spots are placed in the middle of the gray area, extending in a row from the inner margin to just above the black spot. I have taken this butterfly but rarely in eastern Massachusetts, and have had specimens sent me from Ontario. It is found throughout the eastern, middle and western states.

Another tailless variety, but having points on the lower wing, is *Thecla niphon*. The upper side is reddish brown, blackish on the margin of the wings. In the female the middle of the fore wings

and the lower part of the lower wings is occupied by a large patch of rusty brown. This color is wanting in the male, except on the lower wings near the lower angle. The margin of the upper wing is composed of a yellowish fringe, black dotted, and the projections on the lower wings are black with a yellowish fringe between them. The



Thecla nippon.

under side of the wings is reddish brown with numerous reddish, black and white lines and spots covering their surfaces, arranged in a zigzag pattern, the detail of which may be better understood by reference to the illustration than by any written description. The effect is pleasing and is probably protective, rendering the butterfly



Thecla nippon. Under side.

less easily seen by its enemies. This butterfly makes its appearance early in the season, and in the latter part of April and early in May is to be met with on warm days along roads or paths, through forests or tracts of scrub oaks and pines. It is a lively little creature, like so many other members of this interesting genus, and may frequently be seen in numbers of three or four chasing each other about in the warm sunshine. When at rest, on account of its resemblance to a fragment of dried leaf, it is not easily seen, and one must work quickly to take it with the net as it flits past. The larva feeds on the pine and is green in color with a white stripe on each side, and

one of yellow down the middle of the back. The insect inhabits the eastern, middle and western states.



Thecla augustus.

Thecla augustus is a common little butterfly throughout New England early in the spring, and is often seen on the wing soon after the snow has left. The lower wings are slightly scalloped, and a prominent rounded projection is located at the inner angle. The upper surface is wholly dark brown without markings of any kind. On the under side the upper wings are yellowish brown on their



Thecla augustus. Under side.

outer third, while a broad area of reddish brown, outlined with a faint black mark, occupies most of the remainder of the surface, the lower margin being grayish. The outer half of the lower wings is reddish brown, with a row of small black dots running through the middle from the upper to the lower margin. The basal half of the wing is dark reddish brown, with an irregular outline, edged with a faint black line. The body and legs are gray.

It is frequently found in company with *Thecla niphon*. It is not a rapid flyer in comparison with other species of this genus, but it is so small and plain in color that it is liable to escape observation.

This genus of *Thecla* is so well represented in our country, some species are so exquisitely colored, the shapes and habits of many



UPPER SIDE



UNDER SIDE

LIBYTHEA BACHMANI

of the larvæ are so different from those of other butterflies, that it is a group of unusual interest to the collector. Then, too, the life-histories of several of the species are still unknown, or only known in a very imperfect manner. On account of their small size, the extreme wariness, and also the rarity of some of the species, careful observation and patience are requisite to their capture and study, but the hours never seem long or the time ill-spent to him who is keenly interested in the pursuit and study of these minute but fascinating creatures.

The genus *Libythœa* is distinguished by having short angular wings and very long pointed palpi, extending out beyond the head in such a manner that the butterflies belonging to this genus have earned the common names of "Long beaks" and "Snout butterflies." The males have but four well-developed legs (thus showing their close relationship to the *Satyridæ* and the *Nymphalidæ*), while the females have six.

The insects are of different shades of brown, with yellowish and whitish markings. We have but three species in the United States, while but one of these, *Libythœa bachmanni*, inhabits the eastern half of the country.

This butterfly varies a good deal in coloring, some specimens being much lighter and more reddish than others. The markings, also, of the under side are distinct and clear cut in some, and very vague in other specimens.

I have never observed this butterfly in New England, but in the west and south it is not rare, and Packard states that it is found in Central America and the West Indies. I have taken it early in August in some numbers, at Batesville, Arkansas. Here, along the pebbly shore of the White River, a good many specimens could be seen, standing with their wings erect, and sipping the moisture from wet spots in the bed. They were excessively shy and difficult to capture, and when alarmed flew very rapidly, but soon alighted. They did not mingle with the other butterflies, which in places were crowded together in dozens, but always alighted on the water-worn stones well out toward the river.

The larva is dark green, without spines, but having many light yellow points, giving it a rough appearance. According to French, it feeds on the nettle tree (*Celtis occidentalis*), only one egg being placed by the female to a branch. The chrysalis is bluish green and slightly angular.

SATYRIDÆ.

Wood Nymphs. Browns.

The family *Satyridæ* contains a number of medium sized, plain colored butterflies, mostly of different shades of brown, whose only ornamentation usually consists of numerous eye-like spots, most dis-



Larva of Satyrus.

tinctly traced on the under side. The larvæ are cylindrical, tapering toward both ends, particularly the hinder extremity, which is terminated by two points. They are usually covered with soft, short hairs, springing from minute warts. Many species feed on grasses. The chrysalides are not angular, differing in this respect in a striking manner from those of the succeeding family. They are usually sus-



Chrysalis of Satyrus.

ended by the tail from a silken mat, although sometimes they are found loose among leaves on the ground. Like the *Nymphalidæ* they lack the silken thread passing around the body, which is the principal characteristic of the *Papilionidæ*. The perfect insects possess but four well-developed legs, the forward pair being almost aborted. Their wings are broad and rounded at the ends, and their bodies are small and weak. They are sometimes seen in great numbers, and are most often found in or near wooded tracts. Their flight is slow, and most of the species are easily taken with the net.

Our first example of this group, *Chionobas semidea*, is an insect of great interest to the entomologist, on account of its probably being a survivor of an arctic pre-glacial species, driven to more southern latitudes by the cold of the ice age, and later having advanced up the mountain sides as the ice sheet gradually melted, being thus cut off from a retreat to its former northern habitat by intervening regions

too warm for its existence. It is now found rarely on the tops of some of the highest mountains in New Hampshire, and in similar



Chionobas semidea.

situations on the Rocky Mountains in Colorado. In coloring the insect is plain, being an even tint of brown above without spots or markings, save on the upper margin of the fore wings, which is marked with white and dark brown, and the fringe on the outer margin which is light yellowish marked with dark brown spots. This is most distinctly shown on the under side. Beneath, the fore



Chionobas semidea. Under side.

wings are plain brown, except along the upper margin and the apex, which is marked with short, irregular lines of dark brown, yellowish brown and white. The lower wings are marked with light brown,

dark brown and white, the shades being distributed in an irregular manner. The base of the wing is dark brown, then comes an uneven band of lighter brown, outside of which is a wide band of dark brown made up of numerous irregular markings. Beyond this the wing is lighter, with many white streaks, the brown markings again growing more numerous toward the outer margin. The scales are not thickly laid on the wings, and on holding a specimen toward the light it will be seen to be semi-transparent, particularly the lower portion of the upper wings. The thorax is hairy below. The antennæ are spotted with white and brown, and the slender club is reddish.

From the middle to the latter part of July this butterfly may be seen in numbers near the top of Mount Washington, New Hampshire, and one or two other points of almost equal elevation. It is worth a climb of several thousand feet to see this interesting species in its bleak and wind-swept home. The weather is frequently very cold and windy here, and it often hails and even snows in the summer time, but let the sun come out for half an hour, and out will come the butterflies as if they were flitting about a lowland meadow and a snow squall was the last thing to be thought of. They hug the ground pretty closely while on the wing, but they are not rapid or strong flyers, and it is a wonder that ere this they have not been swept out of existence. The larva is said to feed on lichens.



Satyrus alope. Male.

Satyrus alope makes its appearance early in July, and is usually very abundant by the middle of that month in low lands, along brooks or ponds fringed with a line of bushes or trees. It is not a



UPPER SIDE



UNDER SIDE

SATYRUS ALOPE

rapid flyer, generally keeping near the ground and often alighting in the coarse grass or on the foliage of the bushes. The females are



Satyrus alope. Male.

considerably larger than the males, and there is a good deal of variation between individuals in regard to the size of the eye-spots, as the accompanying illustrations from those captured in the same locality



Satyrus alope. Female.

will show. An interesting capture made in Wellesley, Mass., is shown in the following illustration. It is doubtless an albino, and is an example of the strangely colored insects one may occasionally take while collecting large numbers of specimens. The ground tint is a light tan color streaked with light brown, and the patch on the

fore wing is bright yellowish orange, the eye-spots being small and rather dim.

Specimens may be occasionally taken, particularly where the present species and *Satyrus nephele* are found in the same locality, where there is great variation in the size of the yellowish tan patch



Satyrus alope. Albedo.

on the fore wings. In fact, there is a gradual gradation between those in which the spot is large and well defined to others where there is a mere shade of tan color around the two large eye-spots. By some authors the following species, where this color is entirely wanting, is considered but a well-marked variety of *Satyrus alope*. As distinctions between varieties and species are more or less arbitrary, and considering the fact that if we could see all the intervening varieties, one species would blend insensibly into another, one must conclude that a knowledge of the habits of an animal is more useful than an ability to separate by these nice distinctions varieties from species.

As the flight of these insects is weak, they have been obliged to resort to a number of tricks to outwit their enemies. In capturing these butterflies the collector will very soon become acquainted with their modes of escape, which are very interesting, and show no small amount of cunning, scarcely to be looked for in an innocent little butterfly. Their first plan of escape on being disturbed is to make directly for a clump of bushes, into the thickest part of which they dive, and there remain until the danger is past. If one is startled from the grass at some distance from a safe retreat, and the collector overtakes him, he will immediately dodge backward and forward, at

one time high in air and again low down near the grass tops, and in spite of his slow flight, keeping well clear of the net. If the net is at last brought very close to him, he will try his last desperate scheme to elude his pursuer, and shutting his wings quickly together will drop into the grass, disappearing as if by magic. If it were not for the cunning of these frail little creatures, they would doubtless have gone to the wall long ago in the struggle for existence.

The larva is cylindrical, tapering toward both ends, and has a forked tail. It is yellowish green in color, and covered with fine white hairs. When partly grown it passes the winter hidden among the lower stems of the coarse swamp grass, upon which it feeds, and the next summer completes its growth, changes to a green chrysalis, and emerges a perfect fly.

This butterfly with its varieties is a plentiful insect over the eastern half of the country except in the extreme south.



Satyrus nephele.

A more northern species than the preceding, and abundant in the northern part of the United States and Canada, is *Satyrus nephele*. In this insect the upper side is dark brown, without the ochre patch on the forward wings. Two small black eye-spots on the upper wing, surrounded with a faint yellowish brown ring, correspond with the large eye-spots of the preceding species. On the lower wing there is usually a single small black spot. These constitute the only markings of the upper side. On the under side the general color is much the same. The spots on the fore wings are enlarged, pupilled with white, and encircled with distinct rings of tan color. Several smaller rings adorn the lower wings. The inner half of both sets of

wings is marked with short lines of blackish brown, which run together near the body. This area of dark lines is outlined with a heavy irregular dark line. Outside of this on the lower wings the fine dark lines still continue, but they are fainter and shorter. The habits of this insect are identical with the preceding species.



Satyrus nephele. Under side.

Satyrus pegala is a southern species, being found along the gulf states, and as far north as New Jersey on the east coast. It much resembles *Satyrus alope*, but the lower eye-spot on the upper wing is very small and without the central white or bluish pupil. Its habits closely resemble those of the two preceding species, and its larva lives on coarse grasses.

Neonympha eurytris (spelled also *eurythris*) is, where it occurs, one of the most plentiful of butterflies, being seen sometimes in great numbers in upland wooded districts. It is a short-lived little creature, however, and is so fragile and delicate that a cold storm or a heavy wind will destroy it by thousands. This destruction may be easily noticed if a long cold storm occurs during the greatest abundance of the species, as the butterflies, for a day or two afterward, will be scarce and badly worn, and as they again increase in abundance from day to day they will be found to be nearly all in perfect condition, as their numbers are augmented by the hatching out of fresh specimens. This is a pretty good argument for the collector to use when accused of the wanton destruction of innocent life by the over-sensitive persons that are occasionally met with while one is out with the net. How many butterflies will all the collectors in the world capture in one year in comparison with those exterminated by natural causes, sometimes in a single night? Very few, surely.



UPPER SIDE



UNDER SIDE

NEONYMPHA EURYTHRIS

With any of the commoner species the collector is not a factor in diminishing their numbers. These kindly disposed persons, before they pass judgment on the collectors for cruelty, should think of the parasites which so often inhabit the larvæ of butterflies and moths, gradually eating away their substance till they are little more than animated skins filled with a wriggling mass of maggots, lingering in this condition for days, so weak as to be scarcely able to crawl. The industrious and painstaking collector, who is endeavoring to increase his knowledge or adorn his cabinet with fresh and perfect specimens, should have every encouragement; he is a public benefactor.

This butterfly is most abundant the latter part of June, and the woods are then fairly alive with them. At this time many specimens stray into the open fields and may be seen about our dwellings, although they act as though they felt out of place, and would gladly be back in the woods, where they prefer tracts containing a thick undergrowth of bushes. They fly low, just above the ground, with a rather slow but unsteady or jerky motion, and often alight on the low herbage. To get perfect specimens one must take them very soon after they make their appearance, as they are so apt to become worn or ragged. This species is probably double-brooded to a limited extent, as one may occasionally take perfect specimens in August or early in September; but these are scarce in comparison with the June brood. The majority evidently prefer to go over to the next season. The larva is brownish, darker on the sides, and the body is covered with short brown hairs. The winter is passed in the larval state. The insect inhabits the eastern half of the country.



Neonympha canthus. Male.

A somewhat northern species is *Neonympha canthus*, and it is plentiful in parts of New England and Canada. It usually inhabits woods,

but is rarely, if ever, to be found in such abundance as the preceding species, and its time of appearance is later, usually about the middle of July. The insect, though timid, is not a rapid flyer, and seems to be somewhat gregarious in its habits, for, where one is seen, a number may often be started from the trees and bushes in its immediate vicinity.

The saying that "one sees what he is looking for" was never better exemplified than with reference to the collecting of many of



Neonympha caanthus. Male.

our butterflies and moths, and the shy and retiring species under consideration is a good example. Were one not diligently looking for the insect, and acquainted with the kind of locality in which it is



Neonympha caanthus. Male. Under side.

usually found, he would probably never dream of its existence unless by accident he ran across a colony. These butterflies seldom stray far from where they emerge from the chrysalis, and on account of



UPPER SIDE



UNDER SIDE

NEONYMPHA CANTHUS

their delicate structure, their lives are probably very short. There is considerable variation both between the sexes and between individuals of the same sex. The males are generally smaller than the



Neonympha cauthus. Female.

females, and are darker in color. In the female there is usually a light yellowish gray band on the upper side, which crosses the forward wing about one-third from the end, and the spots on both



Neonympha cauthus. Female. Under side.

wings are encircled with yellowish gray. These differences can be readily seen in the accompanying illustrations. The sizes of the eyespots in individuals of the same sex often vary in a marked degree, even in specimens from the same locality. In some they show scarcely more than dots on the upper side, and in others they are large and prominent on both sides.

The caterpillar feeds on grass. It is greenish and downy, and

hibernates over winter in a half-grown state, completing its growth the next season. The chrysalis is green.



Neonympha gemma. Upper and under side.

An extremely delicate little butterfly is *Neonympha gemma*. The wings are light grayish brown, slightly darker toward their outer margins, and are without markings, except two small spots of brown near the outer margin of each lower wing. On the under side the wings are crossed by two faint wavy lines of brown, and next their base are marked with a few short irregular brown lines. Next the outer margin of the lower wings, and bordered inwardly with a grayish pink area, is a row of four sharply-defined small black spots, each having a silvery centre. Several splashes of silver extend along the margin both above and below the row of spots.

This insect is southern in its range, from Virginia southward.



Neonympha sosybius. Upper and under side.

About the same size as the preceding species and of a brownish gray, with slightly pinkish reflections, is *Neonympha sosybius*. The upper side is without spots or markings, except three faint lines along the outer margins. The under side is a much lighter gray,

with two strong brown lines crossing both sets of wings. On the upper wings, beginning near the upper angle, is a row of four brown and one black eye-spots, each surrounded with a yellow ring and having a central silver dot, and this row is continued on the lower wings, where there are three brown and three black spots. Three brown lines follow the margins of the wings.

This is also a southern species, being found from Virginia southward and westward.



Debis portlandia.

Debis portlandia. The general color of this insect is light wood brown, the outer third of the forward wings being pale, with an



Debis portlandia. Under side.

irregular dark line separating it from the general color of the wing. This line is darkest and widest near the upper margin, and is bordered outwardly by a light yellowish gray area. There are three

large dark brown spots with black centres (the lower one being the largest), and one very small spot on the outward third of the upper wing. These spots are surrounded with a ring of pale yellow. On the lower wings are five large dark brown spots, similar to those above. These are arranged as shown in the accompanying figure. The margins of all four wings are darker, and are fringed with white interrupted with tufts of brown scales at the ends of the veins. Two pale grayish lines follow the outer margins of the wings. The thorax is gray, the head and abdomen yellowish brown. The under side is very prettily marked; the general color is about the same as the upper side except that there is a slightly pinkish tinge; but running across both sets of wings, from near the middle of the upper margin of the upper wings, is a wide irregular bar of gray brown, with several indentations and projections on the outer edge. This bar is outlined on both edges with a line of brown. Outside of this is a light yellowish gray area. On the outer third of the upper wing is a row of fine blackish brown spots of various sizes. These are each pupilled with white and encircled with a yellow ring. Outside of this, and enclosing the row of spots, is a line of whitish. The lower wing is also supplied with a number of spots similar to those on the upper wing. The whitish line is also continued, the large spot near the upper margin, and the double spot at the lower end of the row, being encircled by it, while it follows as a wavy line on both sides of the other spots. The entire margin is darker, and a light gray line follows it on both wings. The body and legs are light yellowish; the abdomen near the thorax is white.

This insect inhabits the whole eastern half of the continent, but is very rare in New England so far as my experience goes, although it is a common butterfly in several of the western states. It inhabits wooded districts, particularly the growths of willows along rivers. It is apparently somewhat gregarious, as in walking along the banks of a stream where coarse grasses grow among the trees, one will frequently start it up in numbers, but only in a space covering a few square rods. I have seen it very abundant in Iowa, about the middle of July, along the Iowa and Skunk rivers. The insects usually alight on the tree trunks and among the coarse grasses, and fly but a short distance in a slow and uncertain manner, so that one may catch them in the hands even while on the wing. When not disturbed, they move and turn about at short intervals as if in play, or to take in the view from every direction. The insects vary a good deal in

their markings, some having much larger and darker eye-spots than others.

The larva feeds upon grasses, and is cylindrical in shape, tapering towards both ends, the posterior being forked into two short tails. It is greenish yellow in color, striped with yellow and dark green. The chrysalis is green and smooth, and is often attached to the stems or blades of the grass on which the larva has fed.

NYMPHALIDÆ.

Angle Wings. Silver spots.

The great family of *Nymphalidæ* contains a larger number of species and genera than any other group of butterflies. It comprises many good sized and beautiful insects, and most of our well-known and showy specimens belong to this group. The family has a world-wide range, members belonging to it being found in every country on the earth. Many of the individual species have a wide geographical distribution, several being well known in half the inhabited regions of the globe. Many of the larvæ of these butterflies are covered with spines or stout bristles, while others are adorned with fleshy filaments. The chrysalis is stout, and is suspended from a patch of silk by the posterior end of the body, without the thread of silk which passes around the body of the chrysalis of the *Papilionidæ*. A large number of the chrysalides are angular, some being adorned with stout, sharp pointed spines or projections, while others are comparatively smooth. Some are beautifully marked with golden or silvery spots, and are a delight to look upon. The chrysalis stage usually lasts about two weeks, depending largely on the temperature.

The butterflies of this group are many of them active, rapid flying insects, with stout bodies, and frequently colored in a brilliant and striking manner. They have but four well developed legs, the forward pair being aborted and of very little use to the insect. A deep groove on the lower wings partly encloses the abdomen on either side.

In his excellent work on "Insects Injurious to Vegetation," Mr. Harris describes the way in which a caterpillar of this family sheds its skin and becomes a chrysalis, in such a complete and beautifully written manner, that I have concluded to insert it here instead of describing the process in my own words. He says of the *Nymphalidæ*: "Their caterpillars, when about to transform, do not make a

loop to support the fore part of the body, but suspend themselves vertically by the hindmost feet. As they all secure themselves pretty much in the same way, it may be proper to explain the process. Having finished eating, the caterpillar wanders about till it has discovered a suitable situation in which to pass through its transformations. This may be under the side of a branch or of a leaf or any other horizontal object beneath which it can find sufficient room for its future operations. Here it spins a web or tuft of silk, fastening it securely to the surface beneath which it is resting, entangles the hooks of its hindmost feet among the threads, and then contracts its body and lets itself drop so as to hang suspended by the hind feet alone, the head and fore part of the body being curved upwards in the form of a hook. After some hours, the skin over the bent part of the body is rent, the fore part of the chrysalis protrudes from the fissure, and, by a wriggling kind of motion, the caterpillar skin is stripped backwards till only the extremity of the chrysalis remains attached to it. The chrysalis has now to release itself entirely from the caterpillar skin, which is gathered in folds around its tail, and to make itself fast to the silken tuft by the minute hooks with which the hinder extremity is provided. Not having the assistance of a transverse loop to support its body while it disengages its tail, the attempt would seem perilous in the extreme, if not impossible. Without having witnessed the operation, we should suppose that the insect would inevitably fall while endeavoring to accomplish its object. But, although unprovided with ordinary limbs, it is not left without the means to extricate itself from its present difficulty. The hinder and tapering part of the chrysalis consists of several rings or segments, so joined together as to be capable of moving from side to side upon each other; and these supply to it the place of hands. By bending together two of these rings near the middle of the body, the chrysalis seizes, in the crevice between them, a portion of the empty caterpillar skin, and clings to it so as to support itself while it withdraws its tail from the remainder of the skin. It is now wholly out of the skin, to which it hangs suspended by nipping together the rings of its body; but, as the chrysalis is much shorter than the caterpillar, it is yet some distance from the tuft of silk to which it must climb before it can fix in it the hooks of its hinder extremity. To do this, it extends the rings of its body as far apart as possible, then, bending together two of them above those by which it is suspended, it catches hold of the skin higher up, at the

same time letting go below, and by repeating this process with different rings in succession, it at length reaches the tuft of silk, entangles its hooks among the threads, and then hangs suspended without further risk of falling. It next contrives to dislodge the cast caterpillar skin by whirling itself around repeatedly, till the old skin is finally loosened from its attachment and falls to the ground. The whole of this operation, difficult as it may seem, is performed in the space of a very few minutes, and rarely does this insect fail to accomplish it successfully and safely."

So rapidly is a part of this process performed, particularly the withdrawing of the tail of the chrysalis from the caterpillar skin and the climbing up and fastening of its hooks in the mat of silk, that one can scarcely understand how it is done until he has seen it over and over again.

The genus *Paphia* is confined to the American continent, and most of the species are from Central and South America. The upper wings are pointed, and the lower pair is usually adorned with a narrow tail on each wing. Many of the species are richly colored with purplish brown, pinkish brown, bluish black, greenish black, etc.; but not many are brilliant in comparison with those of other tropical butterflies.



Paphia troglodyta. Male.

A fine insect, found throughout the western and southwestern states, is *Paphia troglodyta*. In color the male is copper red, the outer margin of the wings being brownish on the upper pair and blackish on the lower. The female is not so bright a red, and numer-

ous black markings are distributed over the wings as shown in the figure. On the outer third of both sets of wings is a wide, light area of yellow, which in the upper wings takes the form of a broad band, branching at the top. In the lower wings this yellow band blends into the other colors of the wing about half-way across from the upper margin. The under side of both sexes is much the same and is often a grayish brown, which harmonizes with the bark of trees upon which the insects often alight. This color of the under side is very variable, and specimens may be found varying from light grayish brown to a deep red brown. The caterpillar is a curious looking creature, tapering both ways from the middle, particularly toward the posterior end. The head is of good size, and,



Paphia troglodyta. Female.

when the animal is extended, it is seen to have quite a neck, reminding one in this respect of the larva of the *Hesperidæ*. In color it is bluish green, and the surface of its body is rough, being covered with fine whitish points. Its food plant is the goat-weed. The chrysalis is short and thick, and varies in color from light greenish to greenish brown.

This butterfly I have seen in many places in the west during July and August. It is a strong and rapid flyer, and were it as wary as it is active, it would be a difficult insect to capture. It frequently alights on the topmost twig of a bush, or on a fence post, where it can have an unobstructed view of all about, and from this retreat it sallies forth to meet and give battle to each intruder on its chosen



UPPER SIDE



UNDER SIDE

PAPHIA TROGLODYTA

domain. While the insect is at rest one may cautiously advance quite near, but any sudden movement will alarm it, when off it will go so rapidly that one can scarcely see it. It frequently returns to the same spot in a few moments, and resting with half-spread wings, looks as if daring the observer to make another trial to take it captive. It is sometimes too confident of its powers, and finds itself a prisoner, when its struggles to escape are indeed desperate. So bold is this butterfly at times, that after striking at it with the net and missing it, I have had it alight on my hat or my clothing, as if it considered the performance good sport and desired me to try again.

My brother had an interesting experience with this butterfly during the latter part of July in southeastern Missouri. He discovered, resting on the leaves of trees surrounding a patch of goat-weed, a number of the males of this species, waiting for the females to make their appearance. The males were very shy and active, so much so, in fact, that he almost came to the conclusion that he would not be able to capture any, until he hit upon this plan: after seeing one alight on a leaf, he would carefully walk around to the back of the tree, and then come up under him, when he would see his shadow from the under side of the leaf, and with a quick movement of the net make him captive. The females were not so alert or active, and flew low down near the ground, often alighting on the goat-weed to deposit their eggs.



Larva of *Apatura*.

Species of the genus *Apatura* inhabit North and South America, Europe and Asia, and among them are some of the most brilliantly colored butterflies known. Their sombre ground colors of dark brown and black throw into strong relief the flashing green, blue, purple and lilac with which Nature has so lavishly adorned them. Sometimes these colors are in the shape of wide bars or patches, and again even covering the whole surface of the wings, as

seen in certain lights. The insects are supplied with long, clubbed antennæ, a stout thorax furnishing room for the powerful muscles to move their strong wings, and a short, small abdomen. They are exceedingly active, and fly with great rapidity, although their flight is not usually long sustained. The under side of the wings is usually adorned with eye-like spots. In some species these are numerous, in others there is but one to each side. Several of the most beautiful species inhabit Mexico and Central America.



Apatura clyton. Male.

Our best known of the four species of this genus inhabiting the eastern half of the United States is *Apatura clyton*. There is a good deal of difference in size between the sexes, as will be seen by reference to the illustrations. The upper wings of the male are light rusty brown on the inner half, the outer half being dark brown. Two irregular rows of large rusty yellow spots are located on the outer half, the inner row margined on the inner side by a black line. A row of tawny spots runs along the outer margin, beginning large at the lower angle and growing smaller and finally fading out toward the apex of the wing. Two uneven black marks are placed just below the upper margin on the inner third. The lower wings almost reverse the coloring of the upper pair, and with the exception of the concave inner margin, which is yellowish gray, the inner half of the wing is reddish brown and the outer half reddish yellow or tawny orange. The veins are dark brown, the outer margin brown. Six roundish black spots extend in an irregular line from near the upper margin across the wing to near the lower angle. The thorax and abdomen are greenish brown. The spots and markings of the

upper side of the upper wings are reproduced below, but are fainter, and over the whole surface is a pinkish tinge. This extends over the lower wings also, which are more sombre, and lack the tawny



Apatura clyton. Female.

orange area of the upper side. The inner half next the body is grayish brown, then comes an irregular band of pale yellow, growing darker and blending into the other color toward the lower angle;



Apatura clyton. Male. Under side.

then a wide area of pinkish brown, containing seven black spots, encircled with narrow rings of rusty brown, and pupilled with blue, the lowest spot being double; lastly, there are two wavy brown lines following the outer margin, with a faint yellowish line between them. The thorax and abdomen yellowish gray, the legs light. The

female is not marked so strikingly, and is more yellowish above. The tawny orange patch is lacking on the lower wings, but the large black spots are encircled with rings of reddish yellow. The under side is pale, and most of the markings are softly blended. The round spots are indicated below with obscure spots of brown, only one or two of which have blue centres. A fine line of white runs along the outer margins of both wings. The thorax and abdomen are yellowish gray.



Apatura clyton. Dimorphic form.

A dimorphic form is occasionally taken, in which the lower wing, except the inner third, is dark brown, with a row of large black spots encircled with red brown, outside of which are several vague



Chrysalis of *Apatura clyton*.

crests of a tawny color. This form has been given the name of variety *ocellata*.

The female of this species lays its eggs, which are yellowish white, on the hackberry in a compact patch, usually on the under side of a leaf. The larva is light green in color, striped with yellow.

low. It is rough and firm to the touch, the posterior extremity is prolonged into two short tails, and the head is adorned with curious spiny projections or branching horns, which have suggested the name of antlers to some authors. There is but one brood in a season, and the half-grown larvæ for the next summer's butterflies winter in a torpid state. The chrysalis is yellowish green and somewhat angular.

This butterfly, like all the other members of the genus *Apatura* with which I am acquainted, is a strong and rapid flyer. It frequents the outskirts of woods and groves, and often alights on the trunks of trees. It is very pugnacious, giving battle to all intruders on its chosen domain. The butterfly makes its appearance in July, and it inhabits the southern and southwestern states.



Apatura celtis. Male.

A smaller species than those preceding is *Apatura celtis*. The upper wings are greenish gray or olive gray on their lower half, the upper half being dark brown. Two irregular rows of pale yellowish spots, the outer one extending but half across the wing from the upper margin, are located on the outer half. Two short black marks are placed just below the upper margin. These are bordered externally with pale yellow spots. One black eye-spot, enclosed in a tawny ring, is situated at the lower end of the outward line of yellowish spots. A line of faint tawny spots follows the outer margin. The veins are black. The lower wings have a slightly reddish tinge in comparison with the upper pair, and are darker near their base. A light area on the outer half of the wing contains several small black spots, and outside of these are two dark brown wavy

lines. On the outer margin of all four wings is a narrow white line, interrupted with black at the ends of the veins. The thorax is bluish black, the abdomen brown. The under surface is lighter, the inner half of all four wings being gray with a slightly bluish cast. The outer half is grayish brown. The markings of the upper side are repeated below in a general way. There is an extra eye-spot



Apatura celtis. Male. Under side.

with a whitish dot near the apex of the fore wing, and the black spots on the lower wings are pupilled with blue. The thorax and legs are yellowish gray, and the abdomen rusty. The larva feeds on the leaves of the hackberry. It is light green, with a row of yellow spots on its back and yellow lines along its sides. Its head is adorned with horns as in other species.

My brothers had some experience in capturing this butterfly near Chillicothe, Ohio, in the month of July. It was most plentiful near trees, often alighting on their trunks. When disturbed it flew very rapidly in an eccentric manner for a short distance and then alighted suddenly. Several times the insects lit on their clothing and nets, and once or twice actually on their faces. The habitat of this species is the southern and western states. It does not live farther north than the middle of Ohio, and I have never known of a specimen being taken in New England.

In *Apatura flora* the ground color is reddish tan, with the markings and spots strong and sharply defined. The wings are margined with a heavy dark brown band, and the eye-spots on the lower pair are large and conspicuous.

The female is a good deal larger than her mate, but is much paler in coloring, the wings being also without the heavy dark brown

margins peculiar to the male. The eye-spots are large and conspicuous.



Apatura flora.

This is a common insect in Florida and along the gulf states to Texas, where it has much the same habits as the other species of the genus.



Apatura alicia

Another insect belonging to this genus whose habitat is Florida and the gulf states is *Apatura alicia*. The ground color of the upper side is reddish fawn, paler toward the outer margins. The markings and spots are very distinct, and the outer half of the upper wings is black with white and light yellow spots. The wings are margined with a broad line of brown. The female is somewhat paler, and is also larger than the male.

This species may be easily distinguished from *Apatura flora* and *Apatura clyton* by the eye-spot on the upper side of the upper wing near the outer margin. *Apatura celtis* has this spot, but the insect is smaller and more sombre in color than the present species.

The genus *Limenitis* is distinguished by having straight and slender antennæ, with a gradual thickening toward the end instead of a distinct club. The lower wings are scalloped. This genus comprises several very fine butterflies inhabiting the eastern half of the country, while two or three more occur in the west. The larvæ are interesting from their peculiar manner of hibernating, and also on account of the humps and horns with which their bodies are adorned. They are of various colors, being generally mottled and spotted in a striking manner.



Limenitis ursula. Male.

A very beautiful species of this genus, and one with which almost every young collector is familiar, is *Limenitis ursula*. The butterfly is plentiful in June, and may most often be seen about damp places on the roads, where it is usually so intent on sipping the dirty water that it may be easily taken. After it is once alarmed it is a very difficult insect to capture, as it flies rapidly and is very wary. Sometimes a second brood makes its appearance early in September. In Massachusetts it is not often common at that time of year, but in Ohio and others of the western states the second brood is sometimes as numerous as the first, and under the sweet apple and pear trees I

have often seen many of these fine butterflies resting on the half-decayed fruit, slowly opening and shutting together their blue, purple and black wings, the picture of satisfied contentment. They are very tame under these circumstances, and one may with caution move quite close to them and enjoy their rare beauty.

How many happy hours slip away while one is thus engaged in watching and admiring! What a school this study of entomology is for the children! It takes them into the sunny fields, gives them plenty of exercise, and fills their minds with pleasant and interesting thoughts. A boy with a net in his hand, a cyanide bottle, and plenty



Limenitis ursula. Female.

of insect papers in his pockets, and with a little encouragement in the right direction from his parents, is not the boy who is likely to get into mischief. His mind and time are too well occupied for that.

But I am wandering from my subject. There is usually some difference in size between the sexes of this species of *Limenitis*, the male being the smaller and also the brighter in coloring. The spots of color are usually more sharply defined in the male, and the deep orange spots on the under side are larger and more intense. Occasionally specimens are captured, and these are always males according to my experience, which are a deep rich purple over nearly all of the upper surface. These captures are rare, but the insects are so

beautiful that, when successful, one will consider the time well spent in striving at them.

This species is found over the whole of the eastern United States,



Limenitis. Hybrid. Male.

except the most northern part, where another allied insect, *Limenitis arthemis*, takes its place. Hybrids between these two species, or what are supposed to be such by naturalists, are occasionally taken. These vary from insects which show a slight trace of the white bars across the



Limenitis. Hybrid. Male. Under side.

wings, to those in which the bars are almost as conspicuous as in the following described species. The coloring of the rest of the insect is similar to *Limenitis ursula*. The larva is a curiously shaped and



Upper Side



Under Side

LIMENITIS URSULA

strikingly marked creature. Its body is humped, and rough horns are placed on the forward part of the body. Its colors are brown, white and green, dark at either end, but spotted and variegated in such a way that the insect is difficult to see while feeding, or at rest



Limenitis. Hybrid. Female.

on its food plant, the oak, wild cherry or willow, and looks not unlike that of *Limenitis disippus*; so much so that a person can never be sure when he finds one (particularly as both species live on much the



Larva of *Limenitis ursula*.

same plants), which butterfly it will eventually make. There is frequently a good deal of variation in these larvæ, even when full grown, some specimens being chocolate brown, and almost black toward the head and tail, while others are light green, with a white band over the back, and a brown head and tail. Each of the last brood of the season, while the caterpillars are very minute, makes a silk lined tube enclosed in a small leaf at the end of a twig. This

ingeniously made little habitation, to which the caterpillar always leaves the shrivelled end of the leaf attached to serve as a porch or veranda on which to crawl out, serves as its winter home. This leaf

Chrysalis of *Limenitis ursula*.Chrysalis of *Limenitis arthemis*.

is attached by silk to the twig, and here it weathers the blasts of winter, securely fastened. After the other leaves have fallen in the autumn, these "hibernacula," as they are called, may be easily found and kept in a cool place till the next season, when the broods may be started as soon as the buds begin to open. The chrysalis is as peculiar in shape as the larva, being angular, with a flat projection at the back. It is brown, gray, white and pinkish, the brown predominating.

*Limenitis arthemis*. Male.

Limenitis arthemis, although a somewhat smaller butterfly than the preceding is, nevertheless, a very fine insect. The habitat of this species is much more northern than the last described insect, being found throughout the northern part of the United States east

of the Rocky Mountains, and extending well up into Canada. The butterfly makes its appearance early in July, and in some of the hilly and mountainous districts of New Hampshire is a common butterfly at this time. Near Jackson, and along the Glen road between that place and the base of Mount Washington, is a good locality for this insect during the right season. It is quite abundant at and about Sunapee Lake, and I have taken a good many fine specimens of this and the preceding butterfly near the Sunapee steamboat landing. It frequently alights in the road and on the wayside bushes, and is not very shy, although a good flyer when alarmed. This butterfly is on rare occasions seen as far south as Boston, Mass., and a good many specimens have been taken at Mount Wachusett, near Princeton, in that State. There is little difference in the sexes except as to size,



Limenitis arthemis. Female.

the female being the larger. The caterpillar much resembles that of *Limenitis ursula* and *Limenitis dissipus*, both as to shape and coloring, except that as a general thing there is more brown and reddish brown. The larva hibernates in the same way as the preceding species, and in the next season completes its growth, making a chrysalis which, except in its smaller size, closely resembles the other native species of this genus.

An insect, which in its coloring differs greatly from most of the

other species of the genus, and closely resembles the butterfly *Danais archippus*, which is common throughout the United States, is *Limenitis disippus*. This resemblance is thought by naturalists to be more



Limenitis disippus. Male.

than accidental; that in fact it is a case of unconscious mimicry, in which a butterfly supposedly of good flavor and therefore eatable to birds has, with possibly a slight resemblance at first, by natural selection become more and more like a bitter tasting and therefore uneatable species, until it is an almost exact mimic of it. These examples of mimicry are not rare among many of the butterflies, particularly of tropical countries, and some exceedingly interesting examples have been discovered.

I well remember, when a little boy, thinking that these two butterflies were the same species, and I was sorely puzzled to know how two different kinds of "worms" making two totally different looking chrysalides could possibly hatch out into one and the same kind of butterfly. It was not until I had hatched a good many that the truth gradually dawned upon me. These butterflies may be reared in numbers by searching out the hibernacula during the fall and winter, and starting them on the first leaves of spring. They should be carefully guarded against parasites of various kinds, as the collector may repeat the experience of my brothers, who, having a number, put them to feed out of doors enclosed in netting. By some means the parasites made an entrance, and out of several hundred larvæ they managed to



UPPER SIDE



UNDER SIDE

LIMENITIS DISIPPUS

secure four perfect insects. The parasite is undoubtedly the most serious obstacle to the successful rearing of butterflies, and one must be constantly on the watch or his labors may count for naught.



Limenitis disippus. Female.

This *Limenitis* is the most common species of the genus in the east, and may be seen in June about willows or poplars, on which the larvæ feed. Although most of the last brood of larvæ hibernate over winter in their silk lined tubes, or cases, at the ends of the twigs, a good many complete their transformations in the late summer and fall of the year, and the perfect insects may be taken in September. The tiny green eggs, covered with a network pattern, are deposited singly by the female near the tips of the leaves. The young larvæ are almost black, but when nearly full grown assume almost the exact shape and color of *Limenitis ursula*. The chrysalis is also very similar to that species. The butterfly is not wary nor a rapid flyer, and may be easily taken. It usually frequents the edges of lines of bushes along rivers and brooks, and sometimes alights in the roads with other species of butterflies. This insect inhabits the whole of the United States.

Another butterfly, much resembling the preceding in shape and markings, but of a mahogany color in place of the reddish orange of the other species, is *Limenitis eros*. The black borders of the wings

are very heavy and the white spots show out in strong contrast. The general color is so dark that while on the wing the insect looks almost black. The larva of this butterfly feeds on the willow, and



Limenitis eros.

with its chrysalis is very like that of the last-described insect. It is probably only a well-marked variety of that form. The butterfly is found in many parts of the south, being common in Florida.

Victorina includes a few butterflies of good size and beautiful coloring. The ground color is dark brown or black relieved with wide bars and large oval spots of green. They are inhabitants of tropical America, and but one species strays into the southern parts of our country.

Victorina steneles is a large and strikingly handsome species, the large bands and spots of light pea green contrasting in a bold manner with the dark ground color. The under side is a most peculiar combination of colors; the ground is light yellowish brown and the green spots of the upper side show through below, though they are larger and more yellowish and a number of them are partially outlined with dark brown. As viewed in a side light the surface has a slightly satiny lustre.

This insect is very common in the low and hotter parts of Mexico near the coast, as well as in some of the islands of the West Indies,



Upper side.



Under side.

VICTORINA STENELES.

and I have had many sent me from Para, Brazil. It inhabits open country near forests, and is often seen with other butterflies at rest on the muddy banks of streams.

A very interesting as well as exceedingly beautiful group of butterflies is comprised in the genus *Ageronia*. These are inhabitants of Central and South America and the two species included in our fauna must be regarded as stragglers from lands farther south. The insects belonging to this group are of good size and are richly colored with spots and irregular lines, various shades of blue, brown and light gray predominating in some species. One of the most



Ageronia ferona.

beautiful is an intense blue black with spots of light blue above and red spots beneath. Another has a very pleasing pattern of blue spots and lines on a black ground above, while beneath a large part of the surface is bright red. These butterflies are frequently seen in the neighborhood of dwellings among scattered trees, and invariably alight on their trunks head downwards, with the wings spread wide open. They are exceedingly pugnacious, engaging in fierce battles with one another, and driving away other butterflies who may venture near their chosen retreat. Most curious to relate, they make while on the wing a snapping or clicking noise with their wings, which may be heard at a distance of two or three rods. They are

easily taken with the net when once one learns their habits, for on being disturbed they usually fly downward from the tree trunk on which they are at rest, and the collector placing his net beneath is almost sure to be rewarded with a capture.

Ageronia feroxa is grayish brown with rings and irregular lines of blue and black. There are a number of large and small white or light gray spots on the upper wings and a few on the lower pair.



Ageronia feroxa. Under side.

The under side is much lighter, being almost white, with black markings. In very fresh and perfect specimens there is a pinkish tint with a satiny gloss over the whole surface beneath.

In *Ageronia fornax* the upper side is colored much like the preceding insect, but the under side of the lower wings is light yellowish brown instead of white, and the large spots on the lower wings of *Ageronia feroxa* have almost disappeared in this species. These two insects are occasionally taken in southern Texas. I know nothing of the early stages of these butterflies.

To the genera of *Hypolimnas* belongs a number of good-sized handsome butterflies, generally dark in color, with purple and blue reflections and large white spots. These butterflies are confined almost wholly to the tropics of Asia, Africa and Oceanica and are frequently very abundant where they are found.



Upper side.



Under side.

AGERONIA FORNAX.

Hypolimnas misippus is a common insect in tropical Asia, Africa and Australia, as well as South America, and is occasionally to be found within the borders of our own country in southern Florida. In the males the color is dark purple and blue black with a large oval white spot near the middle of each fore wing and a small one at the upper angle. A large circular white spot occupies the middle of each lower wing. In a ring around the white spots the metallic purple is most conspicuous and will be seen to the best advantage



Hypolimnas misippus. Male.

when the insect is held in a slanting position with its head toward the observer, particularly if the light be at his back.

In strong contrast to the male, the female is reddish orange, the upper wings being blackish brown on the upper and outer portion with several conspicuous white spots arranged in an irregular row crossing the outer third of the wing. Two rows of small light spots follow the outer margin. The lower wings are black bordered, containing faint orange spots along their outer margin.

The male insect is brown and black below with large white patches, which in the lower wings cover half their area. The female is much alike in coloring on both sides.

The female butterfly differs in such a striking manner from the male that one would never guess that they were related. It has a decided look like a *Danaïs* and is supposed to mimic species of that

genus. Indeed, so exactly does it imitate an Indian species of *Danais* inhabiting the same region with it that no one but a



Hypolimnas misippus. Male. Under side.

naturalist would ever imagine that they were distinct species belonging to different genera.



Hypolimnas misippus. Female.

This insect is rather shy and difficult of approach, and when once alarmed flies rapidly high up into the air. It is fond of the sweets from flowers, and when at rest on a fragrant blossom intent on extracting the honey it is most easily captured.

An allied but larger species, *Hypolimnias bolina*, I have seen very abundant in northern Australia, where the gorse hedges covered with yellow blossoms were a great attraction to it. One could approach closely and take these fine insects with little difficulty. Oh! but they were beauties, many of them fresh from their chrysalides; and when one opened the velvety black and rich, shining blue wings of a captive, the sight was dazzling and inspiring. One would think that having so good an opportunity I would have captured all I would ever be able to dispose of, but I am sorry to say that I have now but one specimen of the number I took.



Hypolimnias missippus. Female. Under side.

It can hardly be impressed too strongly on the mind of the collector that he should lay in large numbers of any good thing which he may find particularly abundant at any time.

The beginner frequently starts with the idea that he will make a collection containing one specimen of each species found in his immediate neighborhood. I remember hearing a little boy talking with his sister, to whom he had loaned his new butterfly net, and who had just come in with three splendid specimens of *Papilio turnus*, something after this fashion: "How many of these things do you think I want, any way? I just caught two myself. Now don't get any more, for goodness' sake." Well, after he has made a start he begins to notice that all specimens of the same species are

not alike; the males and females differ, and interesting varieties are occasionally taken. Then he wishes to show both the upper and the under side of the species, and at length he falls in with some other beginner who wants to exchange, and he then thinks of the many good specimens he might have collected. His ideas enlarge with his collections; his collector friends and his need for good specimens for exchange constantly increase, and the truth finally dawns on him that large numbers of first-class specimens are not only a convenience but almost a necessity if he desires to increase his own collection beyond the limits of those which he can himself capture.

Alfred Russell Wallace once told me that one of the hardest lessons he had to learn in his many years of collecting in tropical countries was that it is hardly possible to get too many specimens of a



Timetes petreus.

good species of bird, shell, beetle or butterfly, and that on several occasions he had retraced his journey hundreds of miles to little known islands to procure additional specimens of species he had previously collected, at the time supposing he had taken all he would ever need.

One person can cover but a small portion of the earth's surface during a lifetime, and one can expect to collect personally but a

small per cent. of the grand insects known. But by exchange the treasures of distant lands may be accumulated and the pick of the lepidoptera of the world gathered in one's cabinets.

Timetes is a genus of butterflies easily recognized, the species differing widely in general appearance from others of the *Nymphalidæ*. The lower wings are furnished with long tails, suggesting slightly the *Papilionidæ*.

The coloring in some of the species is very pleasing, rich browns being contrasted with orange and tan, while metallic purple and blue adorn some of them. Many of the kinds are streaked vertically with brown and black. The under side is usually much lighter than the upper. The genus is confined almost wholly to tropical America, and but a few species are reported as occurring within the borders of the United States, and these at the extreme south.



Timetes petreus. Under side.

While my brothers were in Colombia, South America, on the banks of the Magdalena River they found the different species of *Timetes* not uncommon, and captured a good number. They frequented low, open or sparsely wooded districts, and were often seen about the muddy pools in the roads in company with the various species of *Callidryas*. They were not very shy.

Timetes petreus is very angular in outline, at first sight giving one the idea that some one had tried the experiment of seeing what a grotesque creature he could manufacture. The upper wings have a slight resemblance to those of *Grapta*. The tails are long, and blunt at the ends. The colors of the wings are dark reddish orange streaked and margined with black. The under side is light brown of various shades tinged with pink. The body and a narrow band along the inner margin of the lower wings is light buff.



Timetes coresia. Male.

One of the most strikingly colored species of this genus is *Timetes coresia*. The upper side is a rich dark brown deepening to black in a band across the middle of each wing, with a lighter reddish brown space along the outer margin of all four wings. In strong contrast to this dark coloring is the very light under side. The inner half of the wings is almost pure white with two or three faint lines of brown crossing them. The outer half is light brown and buff with an irregular reddish brown band following the outline of the white area across the wings. This butterfly is not at all common, and one

rarely sees it in small collections of tropical American insects, but doubtless, like so many creatures which are considered rare, it is abundant enough in certain localities at certain seasons.



Timetes chiron.



Timetes chiron. Under side.

A species of this genus, which is not rare within the borders of the United States, and which in Central America may be taken in

numbers, is *Timetes chiron*. The wings are brown, streaked vertically with heavy black bands, and with a few light dots upon the outer third of the upper wings. The body is black and dark brown. On the under side the color is much lighter, particularly the inner half of the wings, which is light gray with a pinkish tinge streaked with lines of tan and bordered outwardly with a wide band of creamy white. The outer half of the wings is light purplish brown with numerous vague lines and markings of tan, purple and bluish black. The body is creamy white below. This insect may be found in Florida and Texas.

A group of small but highly colored butterflies comprises the genus *Callicore*. The upper surface of the wings is usually velvety black, sometimes with deep purple or blue reflections to be seen in certain lights. Bars of brilliant shining blue or purple usually cross



Callicore olymena.

both wings. The under side is totally different from the upper, bright vermilion or deep pink usually occupying the greater part of the upper wings, while the lower pair are white or light gray and adorned with curious lines and markings, which in several of the species look like rude figures and letters.

Tropical America is the home of this genus, and at the end of the wet season the muddy roads through the luxuriant forests are often enlivened by the brilliant patches of color displayed by groups of these little butterflies at rest sipping the moisture from the pools. When disturbed they rise in a little cloud, displaying the deep red and flashing blue as they flit about, making an animated and highly colored picture.

Although several kinds of these interesting butterflies inhabit Mexico and Central America, but one species is found within the United States. This is *Callicore clymena*, and, like most of the others of this group of butterflies, it is a bright and pretty insect. The upper surface is deep black with a wide band of satiny bluish green crossing the upper wings diagonally, with a line of the same color following the outer margin of the lower wings. A few scattering blue scales are usually to be seen next the base of the upper wings, and a small white spot is located near the upper angle. The body is black. On the under side the upper wings from their base outward are crimson for two-thirds of their area. This color is margined outwardly with a heavy black band, beyond which are two light gray lines and two black lines occupying the triangular space at the point of the wing. The lower wings are light gray, in some specimens brownish gray. These are marked in the characteristic manner of the genus with black lines and figures which resemble clumsily made letters or numbers, the general character of which can be best understood by reference to the accompanying illustration.



Callicore clymena. Under side.

The upper margin of the wings is adorned with a band of crimson. The body is gray beneath; the antennæ are black tipped with yellow.

This butterfly is very common in Mexico, Central America and Colombia, and my brothers took many specimens in the latter country while there. They were frequently seen in clusters on the dark mud on the banks of streams resting with their wings spread. They were not shy, but when disturbed rose a short distance above the ground, and flew about in a confused manner. The only locality where

this insect is found within the borders of our country is in the southern part of Florida.

The genus *Eunica* contains many very richly colored butterflies of medium size. The ground color is often deep black or brown with bars or patches of rich shining blue or purple in some species,



Eunica monima. Upper side.

while in others the blue or purple extends almost over the whole surface of the wings when the insect is held in certain lights. The under side is often prettily colored with different shades of brownish gray tinged with pink or purple, relieved with spots and markings of deep brown or blue black.



Eunica monima. Under side.

These insects are numerous both in species and individuals in tropical America, where they often congregate on the muddy banks of streams during the hot, quiet hours of the morning. They are not very swift flyers, and the native collectors of Colombia capture large numbers of them. Even in small collections from that country one

will often see the rich blue and purple of several of these insects among other butterfly habitants of that tropical land. Their scales are very easily loosened and their coloring is so dark and rich that a slight touch on the wings with the fingers will seriously injure a specimen. The native Indian collectors are very careless in their manner of handling the insects they capture, and it is sometimes enough to make one's heart ache to see some rare and gorgeous little creature, that would delight a collector and pay him for a day of hard exertion, ruined by the clumsy finger-marks of its Indian captor, who simply looked upon this specimen, with hundreds of others, as a means of purchasing a keg of rum.

Our own native species, *Eunica monima*, is a rather plain insect, being brown above with slightly purple reflections, while beneath it is brownish gray tinged with pink, having a few faint yellowish spots on the upper wings and faint lines of brown on the lower pair. It is occasionally taken in southern Florida.



Eurema lethe.

Another straggler from tropical America, which is occasionally found north of Mexico in Texas, is *Eurema lethe*.

The genus to which it belongs is not a large one, and is mostly confined to Central and South America. This insect is marked in a bold manner, and, although not displaying the iridescent tints of many of the butterflies from the same region, it is rich in coloring.

The ground color on the upper wings is brownish orange with heavy black bands. The lower pair are of a darker shade with spots and markings of black. The body is brown with a slightly greenish tinge on the thorax. Beneath the ground color of the upper wings and the upper half of the lower wings is buff yellow, the lower half



Eurema lethe. Under side.

being wood brown. Over both sets of wings are numerous brown markings, the general character of which may be readily understood by reference to the illustration. The insects from which these figures were made were taken in Colombia by my brothers. The butterfly is a strong and rapid flyer, having a stout thorax with powerful muscles for the rapid movement of the wings.

Another genus of butterflies, whose home is tropical America, is *Anartia*. There are but three or four species belonging to this genus, and but one inhabits the southern part of the United States. These insects are of medium size and plain in colors, though not without a certain beauty.

Our native species, *Anartia jatrophae*, is light gray with brown and black markings and spots, and having a reddish or yellowish brown double row of crescent-shaped spots following the outer margins of both sets of wings. Individuals vary a good deal in intensity of coloring, some being almost white in ground color, the outer margins of the wings being yellowish, while others are dark brown along the margins, with but little red or yellow. The under side is light creamy white shading to gray, with pale bars of brown and the

round black spots of the upper side. A red line follows the shape of the wings a short distance in from the outer margins, and several



Anartia jatrophae. Male.

other red lines accompany the brown markings on both sets of wings. A faint ring of red surrounds the black spots on the lower wings.



Anartia jatrophae. Female.

The illustrations will give a better idea of the insect than any description. The sexes differ a good deal in size, but are otherwise marked much alike.

This insect is very common near the city of Para, at the mouth of the Amazon. Here it inhabits grassy districts, and when alarmed rises but a short distance above the grass tops in its



Anartia jatrophae. Under side.

flight. It is slow on the wing and is not difficult to capture. It is found within the borders of our country, in southern Florida and Texas.

Junonia is a genus containing some very prettily marked and spotted butterflies. Most of the species are found within the tropics both of the Old and the New Worlds.

One of the handsomest species of this genus is *Junonia cœnia*. It varies a good deal in coloring, especially on the under side, which in some specimens is a yellowish gray and in others a maroon gray. Also in the size of the eye-like spots of the upper side there is a good deal of variation. This insect is sometimes found as far north as Massachusetts, numbers having been taken the last two seasons in the town of Medford in that State. In the south and west it is sometimes very abundant, and I have seen it near Stockton, in California, during July, one of the commonest of butterflies. It haunts open fields, and among the low flowering plants it delights to sport. Although a good flyer, it is not very shy. The caterpillar is dark, varying from brown to brownish purple, darker on the back, and having pale stripes on the sides. It is adorned with numerous branching spines along the sides and back. It feeds on the leaves of the plantain.

The following is a list of the specimens in the collection, with their respective numbers and dates of collection.



FIGURE 1. *Colias eurytheme* (L.) (Dorsal view). Length 1.5 cm. Collected in the mountains of the State of New York, August 18, 1899.

The following is a list of the specimens in the collection, with their respective numbers and dates of collection.



The following is a list of the specimens in the collection, with their respective numbers and dates of collection.



UPPER SIDE



UNDER SIDE

JUNONIA COENIA



UPPER SIDE



UNDER SIDE

PYRAMEIS ATALANTA

The chrysalis is stout and somewhat angular, having spines along the back of the abdominal part. It is usually brown in color, sometimes yellowish brown, with the tips of the spines reddish.



Junonia genoveva. Male.

In the extreme southern part of the country is found another species of this genus, *Junonia genoveva*. The insect is a good deal darker than *Junonia cœnia*, but is otherwise marked much like it.



Junonia genoveva. Male. Under side.

The ground color of the wings is dark brown, and in some specimens a dark greenish shade is noticeable, particularly on the lower wings. I have never seen the insect alive, and the specimens here figured were taken in Colombia, South America, by my brothers.

Another form, *Junonia lavinia*, is lighter in general coloring than either of the preceding, but is marked very similar to the last named species. The upper wings are more pointed, and the lower pair have more prominent points on their outer margins than our other native species.



Junonia genoveva. Female.

Some of the most beautiful as well as the most widely distributed and best known butterflies are included in the three genera of *Pyrameis*, *Vanessa* and *Grapta*.

In *Pyrameis* the wings are scalloped, but not angular, the larvæ are armed with branching spines, and they live a solitary life within a rolled leaf. The chrysalides are angular on the sides, and on the back of the thorax is a sharp ridge. Rows of small tubercles follow down the back of the abdomen. The chrysalides are often objects of great beauty, looking as if made in part or wholly of gold, and highly polished. This brilliant coloring is gradually lost as the time for the hatching of the butterfly draws near.

A very pretty butterfly is *Pyrameis atalanta*, and the bars of orange red on its dark wings make it a very conspicuous object, and one of the first to adorn the cabinet of the young entomologist. It frequently hibernates over winter and is among the earliest butterflies to make its appearance in the spring, though such specimens are usually very much faded and worn and look as if the frosts of winter

had bleached them. The insect is said to hibernate in the chrysalis state also, but I have never been able to find the chrysalides in winter.

The first brood usually hatches in July, while the second begins to come out in September, and specimens may be seen from then on till it is too cold for them to fly. They are very partial to decaying



Chrysalis of *Pyrameis*.

sweet apples or pears, and when contentedly sucking the half fermented cider are easily approached and captured. Rum and molasses, the same bait used for moths, is attractive to this insect, and one may sometimes see several of these butterflies at a time about the bait, especially if there are no strong smelling flowers or decayed fruits near. An over-ripe banana split in halves is an excellent bait for this and several other allied butterflies.

The coloring of the under side of the wings is protective, and when the insect has alighted on an old rail or the trunk of a tree with its wings closely pressed together it is a difficult object to see. Its flight is strong and rapid, and although so bright an object while on the wing it is abundantly able to take care of itself. Mr. Harris, in his "Insects Injurious to Vegetation," gives a very well written account of the habits of this insect in its larva state, which I have thought best to insert here. He says: "The *atalanta* butterfly was probably introduced into America from Europe with the common nettle, which it inhabits. It deposits its eggs in May upon the youngest and smallest leaves of this plant, being cautious to drop only one upon a single leaf. The young caterpillar is guarded against injury from the poison prickles of the leaf by the numerous branching spines with which it is covered, and which, being longer than the prickles, prevent its body from coming in contact with the latter. The head is covered with a tough shell, which sufficiently protects this part, while its strong and horny jaws are adapted for cutting and chewing the leaves and their prickles with impunity.

As soon as the caterpillar is hatched, it spins a little web to cover itself, securing the threads all round to the edges of the leaf, so as to bend upwards the sides and form a kind of trough, in which it remains concealed. One end of the cavity is open, and through this the caterpillar thrusts its head while eating. It begins with the extremity of the folded leaf, and eats downwards, and, as it gradually consumes its habitation, it retreats backwards, till at last, having, as it were, eaten itself out of house and home, it is forced to abandon its imperfect shelter, and construct a new one. This is better than the first, for the insect has become larger and stronger, and withal more skilful from experience. The sides of the larger leaf selected for its new habitation are drawn together by silken threads, so that the edges of the leaf meet closely and form a light and commodious cavity, which securely shelters and completely conceals the included caterpillar. This in time is eaten like the first, and another is formed in like manner. At length the caterpillar having eaten up and constructed several dwellings in succession, and changed its skin three or four times, comes to its full size, leaves off eating and seeks a suitable place in which to undergo its transformations. The young caterpillars are almost black; the full-grown ones measure about one inch and a half, are generally of a brown color more or less dotted with white, with a black head, rough with elevated white points, with white branching spines on the back, and on each side there is a row of yellow crescents. The chrysalis is gray, with a whitish bloom upon it like that on a plum, and the little pointed tubercles on its back are gold colored. The chrysalis state continues about ten days, or longer if the weather be cool and wet."

The caterpillars of this butterfly are frequently so abundant as to almost strip the leaves from the nettles, and being protected as they are from the sight of their enemies one would naturally think that their chances of life in the struggle for existence were very good. However, if a number of the full-grown larvæ are collected and examined, one will soon see the eggs of the ichneumon flies, for these parasites have very sharp eyes and even in his curled-leaf home the caterpillar of *Pyrameis atalanta* is not exempt from the fate that awaits ninety-nine one-hundredths of his relatives of other species.

A butterfly having almost a world-wide range is *Pyrameis cardui*. This insect has succeeded in establishing itself over Europe, Asia, a good part of North and South America and the Sandwich Islands,

and varieties or closely allied forms are found in New Zealand and Australia. It does seem strange indeed in a land where the trees, flowers, birds and mammals are all new to one and where every few steps bring one in contact with something never before seen, to suddenly come upon a bright little butterfly as well known as the faces of one's near relatives, and looking, like the other inhabitants of the country, perfectly at home. It is like meeting a friend of one's childhood in a distant land.

The insect is double-brooded in our latitude, the butterflies of the first brood making their appearance early in June and others later in August. Flowers are very attractive to this insect, and in favored seasons a patch of the second growth of clover will be found a good hunting ground for them. They are agile and restless creatures, seldom remaining long in one spot, and flying very rapidly when once alarmed. In neglected pastures, where thistles, the food plant of the larva, abound, one may usually look for this insect with good prospects of finding it plentiful. The species is very common in Tennessee, and the largest and finest specimens I have ever seen came from that State. In fact, those from which the transfers for this work were made are from that region.

Besides the thistle the caterpillar feeds on the leaves of the burdock and sunflower, and with silken webs curls over the edge of the leaf beneath which it lives and feeds, finally, as in the preceding species rendering its home uninhabitable and constructing a new one. The caterpillar is dark brown or black striped with yellowish brown on the sides, and is armed with many branching spines of a gray color tipped with black. The chrysalis, which is often suspended from the under side of a leaf of its food plant, is an exceedingly beautiful object, being brown or purple brown with spots of burnished gold on its sides and back, and looking more like a jewelled ear-ring than the nymph of a butterfly.

Another butterfly closely related to the preceding and looking much like it in all three stages of its existence is *Pyrameis huntera*. In habits it also much resembles *Pyrameis cardui*, while the caterpillar feeds on the same plants. When fresh and perfect this is one of the most beautiful of butterflies, the rings and lines on the under side of the wings of delicate tints being arranged in a very pleasing manner. This insect is found over all of temperate North America, and with *Pyrameis cardui* and *Pyrameis atalanta* is frequently seen in the fields of clover and on the blossoms of the thistle.

A very curious form of this species was captured in Dover, Mass., in August of 1898. This specimen is now in my possession and a figure of each side of it is here given. The colors above are



Pyrameis huntera.

streaked and run together and beneath the wings are almost white on their outer portion. Unfortunately the specimen was damaged before it reached me. What could cause such a variation in the



Pyrameis huntera. Under side.

color and markings of a single individual it is difficult to say. Such variations are rare, but in catching hundreds of specimens they now and then come to the net of the collector.



UPPER SIDE



UNDER SIDE

PYRAMEIS HUNTERA





UPPER SIDE



UNDER SIDE

VANESSA ANTIOPA

In the genus *Vanessa* the insects are of medium size, and their wings are notched or somewhat angular in outline. They inhabit the temperate regions of the earth and are strong and hardy butterflies, frequently withstanding the rigors of a semi-arctic winter in a torpid state and reappearing the first warm days among the earlier harbingers of spring.

The *Vanessa antiopa* is one of our commonest and best known butterflies, and, from the ease with which the larvæ are gathered and reared, it is one of the first insects with which the beginner is likely to become acquainted in all its stages.

The butterflies, very worn and faded, make their appearance early in the spring, coming out from their winter quarters, where they have hibernated among heaps of stones, beneath the loosened bark of decayed trees, etc., frequently before the snow has left the ground in the forests.

The females lay their eggs in clusters on the twigs of the poplar, elm and willow and on hatching out the dark colored, spiny larvæ live a gregarious existence until they are full grown, when they separate and, descending the tree on which they have lived, suspend themselves by the posterior legs to a mat of silk spun beneath the projecting point of a rock in a stone wall, or under the top board of some fence, to await their transformation to the chrysalis state. These larvæ frequently damage the shade-trees in our suburban towns to no small extent.

The larva when fully grown is dark brown in color with a row of red spots running down the middle of the back. It is covered with formidable branching spines, and the caterpillars are often clustered together on a branch in such a mass as to make it bend down with their weight. One will often see the sidewalks sprinkled with their droppings, the branches overhead being stripped of their leaves by these insects.

The chrysalis is angular and spiny, of a brown or purple brown color, with rows of reddish colored tubercles on the back of the abdomen.

If one wishes to watch the transformation from larva to chrysalis and from chrysalis to butterfly, there is no insect, to my knowledge, where the whole process is so easily studied. The caterpillars may be procured by the hundred when nearly full grown, and by putting them in a roomy box with a few handfuls of fresh leaves one will have the satisfaction of seeing them attach themselves to the cover

within a few days from the time they were gathered. Their change to the chrysalis state is an interesting operation, and by placing the box cover in a horizontal position, where one can watch it from below, the minutest detail in the process may be watched with ease. Then, too, one has not long to wait for the butterflies to hatch, and in this way a fine lot of perfect specimens is assured.



Chrysalis of Vanessa.

On emerging from its chrysalis the butterfly voids a red colored liquid which looks somewhat like drops of blood. As many of these butterflies and allied species frequently hatch at about the same time, the sprinkling of this red liquid on the streets and houses of towns has given rise in olden times, among the superstitious inhabitants, to stories of showers of blood which were supposed to foretell disasters or wars.

This butterfly inhabits Europe, and is supposed to have been introduced into America from there. It is not common in England, and the collector there capturing a fine specimen considers he has taken a prize.

A much smaller but bright and attractive butterfly is *Vanessa milberti*. It is a much more northern species in its range than the preceding, being rarely found in the southern or middle portion of the United States. It is, however, common in northern New England and Canada, and, like the preceding, makes its appearance early in the spring and again later in the summer.

The larva, which is dark and covered with short spines, feeds on the nettle and leads a gregarious life in the earlier part of its existence. The butterfly is a wary and agile little creature, frequently opening and closing its wings in a sudden and nervous manner while at rest, as if it were impatient to be off. The under side, like that of *Vanessa antiopa*, is protective in coloring, rendering it difficult to see until it opens its wings. It is rare at my home in Wellesley, and we

When the caterpillar has finished its work, it spins a cocoon, and in this it remains until it is ready to emerge as a butterfly. The cocoon is made of a substance called silk, and is very strong and elastic. The caterpillar is able to move about in the cocoon, and to breathe through small openings in the shell.



The butterfly is a very beautiful insect, and is found in all parts of the world. It is able to fly very fast, and is able to visit many flowers. The butterfly is also very important to the farmer, as it is the only insect which is able to visit the flowers of the clover, and thus to pollinate them.

The butterfly is also very important to the artist, as it is the only insect which is able to visit the flowers of the clover, and thus to pollinate them.

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Upper Side



Under Side

VANESSA MILBERTI

seldom take more than two or three specimens in a season, but I have obtained many fine ones from Ontario, Canada, where a friend rears them from the egg. An allied species of about the same size is found plentifully in the foothills in northern California. This is *Vanessa californica*, and it much resembles the European form *Vanessa polychloros*.

To the genus *Grapta* belong several butterflies inhabiting Europe and America, whose wings are very angular in outline and bear near the centre of the lower pair on the under side a silvery mark, suggesting in some instances a letter or a figure. From these rather fancied resemblances some of the species have received their names. These butterflies are of medium size and handsome in coloring, being mostly some shade of orange or reddish brown with black or brown markings. The outlines of their wings, too, like the lines of a fast sailing vessel, suggest speed, for they are very active creatures and even while at rest look alert and ready to take wing the instant danger threatens. They are very common in Canada and in the northern and middle parts of the United States.



Grapta interrogationis.

Grapta interrogationis is one of the largest of this group of insects and is certainly one of the finest and an ornament to any cabinet. There are two well-marked forms, which are so different in color as to quite puzzle one at first. The most common form is

reddish orange on both sets of wings with deep reddish brown or pinkish brown mottlings extending along the outer portions, which



Grapta interrogationis.

are edged with purple on their outer margins. The wings bear several black spots. The under side is light reddish brown with a few faint brown lines.



Grapta interrogationis.

With the other form the upper wings are much the same as in the form just described, except that they are usually somewhat darker along their edges and often lack the purple or violet margins.



Upper Side



Under Side

CRAPTA INTERROGATIONIS

The lower wings, however, are quite dark, being almost black except near their base, while the under side of the insect is frequently dark purplish gray with wide irregular bands of brown.

The silvery spot is quite conspicuous in this form, as the dark color surrounding it brings it into prominence.

There are two broods in a season, one in June, and the other, which is much the larger, in September. The butterfly frequently hibernates during the winter, and, like *Vanessa antiopa*, makes its appearance early in the spring.



Grapta interrogatilis. Under side.

The caterpillar is brown with light yellowish mottlings, and a yellow stripe low down on each side. The branching spines with which its body is armed are yellowish tipped with black. It feeds on the hop, and in some localities does considerable damage. The elm is also attacked by it, particularly the young trees, but I have never seen it in sufficient numbers to do them any great injury.

The chrysalis is light brown with a slight purplish tinge and has several silvery or golden spots on the back. It is angular and spiny, with projections like ears on the anterior end, and a sharp ridge at the back of the thorax.

Like many other butterflies, this species is very partial to half-decayed sweet fruits, and is often seen with other kinds in autumn in pear and peach orchards. It is an easy insect to rear in confinement, but greatly subject to the attacks of parasites.

Several other species of the genus *Grapta* are plentiful in the

northern and eastern states. Three of these look so much alike that it is difficult for the beginner to separate them, the differences being most easily recognized from the under side and from the shape of the silvery mark on the hind wing.



Grapta comma.

In *Grapta comma* there are two well-marked forms, as there are in *Grapta interrogationis*. In one form the color of the upper side is



Grapta comma. Under side.

much the same on both sets of wings, being orange with black spots margined with reddish brown, in which are several orange spots, and having a purple gray edge. The under side of this form is usually

mottled with gray and dark brown, the brown in some specimens assuming distinct irregular bands, while in others the whole under surface is a plain grayish brown, often having a pinkish tinge.



Grapta comma.

These differences are well shown in the accompanying figures. The silvery spot is usually in the shape of a rather sprawling G. In the other form the upper wings are yellowish tan, while the lower wings are dark brown, showing very few spots. The under side usually is



Grapta comma. Under side.

much lighter than in the first described form. These two varieties are not equally abundant, the last described form, in those I have collected, being in the ratio of about one to six to the former.

The larva feeds on the hop, nettle and elm, and is light yellowish in color, with whitish spines tipped with black. The chrysalis is also light, varying from almost white with gray mottlings to light grayish brown. It has golden markings on its dorsal side.



Grapta comma. Under side.

The habitat of the species is the northern part of the eastern half of our country, but it also extends into the southern parts of Canada. Like other members of the genus, it is a very active butterfly, and while on the wing its movements are so rapid that one can hardly follow its eccentric flight with the eye. If frightened away from a favorite retreat it is almost sure to return in a few minutes, and by stealth it may be easily taken. I have seen it very abundant in northern Ohio in August and September, where it is probably double-brooded. It is frequently found about farms and stables, where the powerful odors probably attract it.

A most beautifully mottled insect on the under side is *Grapta faunus*. The outlines of the wings are more notched, and there is more contrast in the markings of the under side than in any other eastern species of this genus with which I am acquainted. The margins of the wings above are dark, and the spots are heavy and large in proportion to the size of the wings. The under side is brown and gray with several sharp black lines and a number of vaguely defined green spots. The markings are all very irregular, and the general effect is like a bit of torn and decayed bark. Mr. Comstock states that "The larva feeds upon black birch, willow, currant and wild gooseberry." I have never seen it, and know nothing

of its colors or habits. The butterfly is much more northern in its range than the preceding species, and seems to prefer mountain



Grapta faunus.

districts. I have taken a good many specimens in the hilly parts of New Hampshire, and it must be abundant in parts of Canada, judging by the numbers I have had sent me from different places.



Grapta faunus. Under side.

Another species of *Grapta* occurring in the northern part of the United States and Canada is *Grapta progne*. The coloring of the upper side of the wings resembles that of *Grapta comma*, but the markings below are quite different, being light brown and gray, without the irregularities of the other species, as there are many fine lines running diagonally across the wings. The silvery mark is thin and

L-shaped, which is perhaps the most distinguishing characteristic. The larva feeds on the elm and gooseberry.



Grapta progne.

The species *Grapta j-album* differs a good deal from other species of this genus, and by some authors is included in the genus *Vanessa*.



Grapta progne. Under side.

It is a fair sized insect, stout bodied and powerful. The coloring is rusty yellow, shading to reddish brown, with numerous heavy black and brown bands and spots. Near the upper angle of the upper wing

is a white spot, and below the middle of the upper margin of the lower wing is another larger white spot. These spots are both



Grapta j-album.

divided into two by a dark vein. The under side is grayish brown,



Grapta j-album. Under side.

having a few lines of black with an irregular greenish line near the margin. There is considerable variation in the coloring of the under

side, as the accompanying illustrations will show, some being almost one plain gray tint, while others are marked with bands of brown, gray and white.

This is a northern species, ranging over the northern temperate parts of the continent. I have never seen the larva, but, according to Mr. W. J. Holland, it feeds on the different species of willow. Mr. G. H. French says, "The chrysalis is one inch long, of a beautiful green color, delicately reticulated, with six golden spots on the back." The perfect insect is sometimes very common, especially in the hilly portions of New Hampshire, where one may take it in



Grapta j-album. Under side.

July in numbers. One of my brothers succeeded in taking several hundred perfect specimens of this species near Madison, in New Hampshire, last season. They were wild and shy, but were quite abundant. They frequented little used country roads, where they usually rested on the damp earth, sometimes several close together. When frightened they flew up and alighted on the trunks of poplar-trees, with their wings folded close together, the gray and brown color of the side exposed to view giving them the appearance of partially loosened pieces of bark. When struck at with a net while on the wing they sometimes feigned death by closing their wings and falling onto the road, with which their colors readily harmo-



UPPER SIDE



UNDER SIDE

GRAPTA J-ALBUM

nized. They would even suffer themselves to be taken up and handled without displaying the slightest signs of life, until suddenly assuming activity they started off at a great speed.



Grapta gracilis.

A species of *Grapta*, of which I was so fortunate as to obtain specimens in the White Mountain region of New Hampshire, is *Grapta gracilis*. It is a small species, rather dark reddish above



Grapta gracilis. Under side.

with dark brown or black margins to the wings. On the under side the inner half of the wings is dark brown. This color ends in a sharp and irregular outline, close to the edge of which the white silvery mark is located and brought into strong relief.

Outside of this dark area is a light gray band which blends by insensible degrees into the dark margin of the wings. On close inspection one will see many short, fine brown lines, which look as

if made with the point of a very fine pen, distributed over the greater part of the surface of the under side of the wings. In habits and mode of flight this butterfly resembles others of the genus already described. It often alights on the roads where they traverse woods, and is so active and wary as to make its capture difficult. The species is found in northern New England and Canada, and is generally considered somewhat rare.

The genus *Phyciodes* contains a large number of small and plainly colored butterflies of a tan or brownish orange color with dark brown or black markings. They are found over all parts of our country and are usually among the commonest of butterflies, actually swarming in May and June and again in August and September. So much alike are the different species that a collection containing the many kinds will at first give one the impression that they are all of one or two species with variations. Varieties differing both in colors and markings are common, and where the different species are so much alike, it is scarcely necessary to state that it is at times exceedingly difficult to separate them.

As the many kinds of these butterflies are interesting only to the specialist, I shall not weary the reader with figures and descriptions which must of necessity be very dry and lacking in interest to a lover of the beautiful, the rare and the curious in Nature.

Phyciodes tharos is a very common little butterfly in June and again in August in our fields and meadows, where it delights in the blossoms of the low plants, several butterflies sometimes being seen on one flower. It is slow and feeble in flight. The larva feeds on the plantain, and is dark in color and covered with short bristles.

The genus *Melitæa* contains a large number of butterflies of rather small size, which are closely related to *Phyciodes*. They are inhabitants of the north temperate parts of the world, particularly in mountain districts, and the western part of our country is rich in species. The genus is well represented in western Nevada near the base of the Sierra Nevada, where in June several pretty species may be taken in large numbers.

Our eastern species, *Melitæa phaeton*, is one of the finest of the genus, and is a general favorite with collectors. The color is brownish black with several rows of buff round spots and crescents on the outer half of the wings. Along the outer margins of both sets of wings is a row of brick red spots. The body is black with several small whitish dots along the sides of the abdomen. On the



UPPER SIDE



UNDER SIDE

PHYCIODES THAROS

under side the ground color is not so dark. The rows of light spots are more numerous and the reddish spots along the margins are so close together as to make an almost continuous band. The inner third of the wing is blotched with a number of large reddish spots



Melitea phaeton.

with light yellow spots surrounded with black rings between them. The body is dark brown below with reddish spots on the abdomen, and the legs and palpi are reddish.



Melitea phaeton.

This butterfly, although rarely seen except by those who know where it is to be found and are in diligent search for it, is not rare in New England. It is extremely local in its distribution, being found about meadows or swampy districts, and usually in numbers

from a dozen to a hundred in a small space of a few square rods. It is an easily captured species when once found as it is not shy; its flight is feeble and is not long sustained. It rarely comes into the upland fields or gardens. There is but one brood in a season, the butterfly making its appearance about the middle of June, and continuing to fly for about a month. The female lays her eggs in a cluster on the snake head (*Chelone glabra*), and when the caterpillars hatch they spin a web, drawing the leaves together at the top of the plant. In this web or nest they live and feed until cold weather, when they cease feeding, and remain in it in a dormant state throughout the winter. In the spring they again commence feeding, and when their growth is complete, they separate and seek a retreat in which to pupate.

The larva is covered with stiff black bristles, and the chrysalis is gray with dark brown spots.

Many grand butterflies belong to the genus *Argynnis* and several of the finest of the group are natives of the eastern half of the United States, where at certain seasons they are among the most abundant of butterflies.

Many of the species are of good size and very beautiful. The usual color of the wings is reddish tan or brownish orange with sharply defined dark brown or black markings in the shape of irregular lines and spots, while beneath, the ground color is generally somewhat lighter. On the upper wings, except along the outer margin and in the space at the upper angle, the markings of the upper side are repeated, but are less sharply defined. The lower wings and the outer margins of the upper pair are usually adorned with brilliant satiny white spots, which look as if made of silver and highly polished.

In a few of the species the males and females differ greatly, but in the majority of kinds they are much alike.

According to Mr. Comstock, "More than fifty species occur in America north of Mexico." Many kinds resemble each other closely, so that they are at times very difficult to separate. Mr. Holland, writing of this genus, says, "Owing to the fact that there is a great tendency in many of the forms closely to approximate one another, the accurate distinction of many of the species has troubled naturalists, and it is quite probable that some of the so-called species will ultimately be discovered to be merely local races or varietal forms."



Male.



Female.

ARGYNNIS IDALIA.

The caterpillars are covered with fleshy spines and bristles. They feed upon the different species of violets, and are nocturnal in their habits, hiding by day. Many of the species hibernate over winter in the young larval state and resume feeding the next spring. The chrysalides are slightly angular with rows of blunt tubercles on the dorsal side. They are frequently light reddish brown or pinkish brown in color, and some are adorned with spots of yellow and dark brown.



Argynnis idalia. Under side.

The number of species of this genus to be found in the western portion of this country is very great, but none of the forms from the far west are to my thinking the rival in beauty of our own richly colored *Argynnis idalia*. In the female the upper wings are reddish orange with heavy black margins and spots, and have a row of cream colored spots extending along the outer margin. The lower wings are black with a purple tinge, except on the upper portion, which is yellowish brown. Two rows of large cream colored spots adorn the wings, while a row of narrow elongated spots follow the fringe on the outer margin of both sets of wings. Beneath, the upper wings are a little lighter and more reddish, with the black markings less distinct, while along the upper and outer margin are several silvery white spots enclosed in rings of black.

The lower wings are brown with many large creamy spots, having a satiny lustre, arranged in irregular rows across them. These spots are also enclosed in rings of black. The male resembles the female except that it is smaller and generally lighter, and the outer row of spots is reddish orange instead of cream color.

This, our largest and handsomest *Argynnis* in New England, is found during the latter part of July and the first of August in low meadowy districts, where its favorite flower, the wild flax, as it is sometimes called, or the swamp milkweed, lives. In exceptional seasons this insect is plentiful, and one may see one or more of these large and richly colored flies about every clump of its favorite blossom. It sometimes visits the upland fields of clover and occasionally the flowers of the garden. It is a wild insect and a strong flyer, and when once alarmed it will tax the wind and endurance of a good runner to overtake it.

The insect is found throughout New England and the middle and western states, as far west as Dakota. The finest specimens I have ever seen came from Illinois, and their richness of coloring and size made them well worth the trouble of capturing.

In the mountainous districts of Virginia, Carolina, Tennessee and Arkansas is found the most magnificent species belonging to the genus *Argynnis* which inhabits this country. This beautiful butterfly is *Argynnis diana*. In size there are few species of the group in the world which equal it, and but one or two with which I am acquainted which rival it in beauty.

In the male insect the inner portion of each wing is a rich dark brown bordered by a wide band of tawny orange, across which run several narrow lines of brown, between which are round brown spots. The under side, especially on the lower wings, is a good deal lighter where the large area of dark brown gives place to light brown, while on the upper wings the same area is black with several tawny orange markings. Two lines of elongated silvery spots cross the lower wings, the line near the outer margin being the more distinct. The female is often a good deal larger than the male and in coloring is totally different, the ground color of the wings being a rich greenish or bluish black. The outer portion of the fore wings is crossed by three rows of bluish white spots, while the same portion of the lower wings has one row of large blue spots, each enclosing a round black spot, and one row of elongated bluish white spots near the outer margin. The under side of the female is brown with the



UPPER SIDE



UNDER SIDE

ARGYNNIS IDALIA



Male.



Male. Under side.

ARGYNNIS DIANA.

lower wings somewhat lighter, which are marked with blue and black spots. A few silvery crescents are to be seen on the lower wings along the outer margins. The female is much the more striking insect of the two, and its size and rich dark color make it a conspicuous object while on the wing.

This insect, particularly the female, has been until quite recently, a rare insect in collections, and has brought high prices. Even at present, when its habitat is well known and many of these fine but-



Argynnis diana. Female.

terflies are taken every season, it is still an uncommon insect to see in any but large collections. It is an active and wary butterfly and as it is usually found in very hilly regions, the successful collector is likely to have many a spirited chase for it.

The inhabitants of the regions where it is found in Kentucky, have by this time become familiar with the sight of an able-bodied man going about with a butterfly net, but a few years ago a man could scarcely invent a way in which to make people regard him with more suspicion.

This insect makes its appearance in July, and is sometimes seen in some abundance. The females are much less common than the males. A collector friend of mine who had never seen this insect alive, was out with a net one day in Western Virginia, and came suddenly upon three of these fine insects, two males and one female, in the road. They immediately rose in the air and circled about him, while my friend was so much surprised and so fearful, that they would leave if he made the least motion, that he stood like a statue not daring to make a strike lest he should miss, until they were well out of his reach.



Argynnis cybele. Male.

Argynnis cybele is also a large and very handsome butterfly. The sexes generally differ a good deal in size, the male being the smaller, while its markings are less heavy, and the ground color is lighter and more reddish. On the under side, too, the female is darker than the male, the silvery spots showing to better advantage.

During July this insect is one of our most abundant species, frequenting flowering plants growing in meadowy land, particularly the swamp milkweeds, on the pink clusters of which one will often see two or three of these fine butterflies.

It is a swift flying insect but does not seem to be shy when feeding.



UPPER SIDE



UNDER SIDE

ARGYNNIS CYBELE



UPPER SIDE



UNDER SIDE

ARGYNNIS APHRODITE

This insect is one which is nearly always plentiful during its season, and does not seem to have its seasons of scarcity like so many species. The western species seem to be finer and larger than those found in the east, and the flowers along railroads or on the banks of rivers may almost be said to swarm with it at times. The larva is dark colored and spiny, and like others of the genus lives on violets, feeding by night and hiding close to the



Argynnis cybele. Female.

roots of the plant during the daytime. The half-grown larva passes the winter in a dormant state and completes its growth the next spring.

This butterfly has a rather wide range, being found in the eastern, middle and western states as far west as the great plains and north into Canada.

Closely related to *Argynnis cybele* is *Argynnis aphrodite*, and at the first glance the two species would be thought the same. The latter, however, is smaller and usually somewhat darker and richer in coloring. This darker coloring is best seen from the under side.

The yellow band following the outer margin of the lower

wings beneath is narrower in this species than in *cybele*, a characteristic by which the two species can be readily distinguished. The females are occasionally very dark beneath, the lower wing being chocolate brown and the silvery spots looking like discs of the pure metal highly polished.

In July and August this butterfly is at times plentiful, but I have never seen it so abundant as *A. cybele*. It seems to be more northern in its range, and one of my friends living in Ontario, Canada, has sent me many fine specimens. In habits it much resembles the preceding species.

Argynnis alcestis is about the size of *A. aphrodite* and much resembles it. The coloring is dark and rich, and the yellow band along the margin of the lower wings is wanting. Specimens are occasionally taken which are very red beneath on the basal part of the upper wings. I have never seen the insect abundant, but have taken it near Chicago, Illinois, in July, where I was given to understand by a local collector, it was at times very common. The specimens taken there were very fine and well repaid the stop of a few hours for their capture. This is a western species occupying the upper part of the Mississippi valley.

A butterfly smaller in size, but scarcely less brilliant in coloring beneath than *A. aphrodite* and resembling it a good deal, is *Argynnis atlantis*. Although there is often a good deal of difference between the males and females of this species in the intensity of their coloring, the female being the darker, in size they are about the same, and one rarely sees the discrepancy in size so noticeable in *A. cybele*.

This butterfly is abundant in the hilly parts of New Hampshire early in July, where it may be seen on the flowers and bushes by the roadside or winging its way across the upland meadows. It is quite common about Sunapee Lake, where many of the specimens for the illustration of this work were obtained.

Like the other members of this group, the larva feeds on violets, and hibernates when half-grown through the winter. There is but one brood in a season. It is a rather northern species and only inhabits the middle and southern states along the ranges of mountains. It is common in Canada.

A very common little butterfly during May and again in August, in the meadows and swampy lands, is *Argynnis myrina*. It resembles the larger species of the genus in the tawny orange



UPPER SIDE



UNDER SIDE

ARCYNNIS ATLANTIS



UPPER SIDE



UNDER SIDE

ARGYNNIS BELLONA

color of the wings and the silvery spots on the under side, but is a weak little creature, its flight being slow and feeble. It is usually very common in its season and may be seen clustered on the flowers to which it is partial, or flying lazily just over the grass tops of the damp meadow. On a small patch of meadowy land they fly back and forth, not often venturing far from it onto the high land.

The species is double-brooded, and inhabits the northern part of our country and Canada. It is a pretty little insect, as will be seen by reference to the transfer. The specimens for this work were taken in and about Wellesley, Mass., where it is usually very abundant.

Another species much resembling *A. myrina* in size and general markings, but differing from it in not having the silvery spots beneath, is *Argynnis bellona*. This little butterfly is also very abundant and an inhabitant of the same character of country as the preceding species, where it may be taken at the same time of year.

Curiously enough, however, the two species do not mingle to any great extent and they will seldom be found equally numerous in the same meadow. This is often quite noticeable when two small patches of low wet land are divided by a ridge of high ground; one species may occupy one patch and the other the next, each keeping pretty well to itself. This is also a slow and weak flying insect, keeping close to the grass tops while on the wing and seldom venturing far from the low meadows. It is double-brooded like the preceding, and is found over the northern half of the United States east of the Rocky mountains. It also occurs in Canada.

Argynnis montinus is a rare little insect found on the barren tops of the White Mountains in New Hampshire.

It much resembles *A. myrina*, except that it is darker and more reddish. The under side of the under wings is not adorned with the brilliant silvery markings of *A. myrina*, but with irregular white markings on a reddish brown ground.

I have never been so fortunate as to see this butterfly alive, and although I visited Mount Washington and the other peaks near in the hopes of finding it, I was unsuccessful.

This butterfly is supposed to have been stranded on the high peaks of the White Mountains at the end of the glacial period in

much the same manner that the presence there of *Chionobas semidea* is accounted for.

Of the genus *Euptoieta* we have but one species in the United States. It is a southern insect and rarely gets as far north as New England. The insects of this group are rather plain yellowish brown butterflies, with brown and black markings, having no silvery spots on the under side, and in this respect showing a strong contrast to most of the species of *Argynnis*, their near relatives. Their larvæ are adorned with rows of short black branching spines, the ones near the head being the longest and are directed forward. They feed on the leaves of the passion vine.

Euptoieta claudia is a medium sized butterfly, very plentiful in the south and southwest, where it flies in open fields and along the edges of forests. It is very abundant in Arkansas, where along the White River I have captured many specimens in the latter part of July. The larva of this species is brownish orange striped with brown and spotted with white on the back. The chrysalis is light gray spotted and streaked with black. The insect is an inhabitant of both North and South America, and is often seen in collections from Brazil.

To the genus *Agraulis* belong some exceedingly beautiful butterflies of medium size. They are insects loving warm climates, and are very abundant in the tropical and subtropical parts of America. Their coloring above is tawny orange or reddish orange marked with black, while below it is lighter, in some species having a decided pink tinge near the base of the upper wings, while many brilliant silvery spots adorn both sets of wings. The larvæ are armed with branching spines, and they feed on the various species of the passion vine.

But one species occurs within the borders of this country. This is *Agraulis vanilleæ*, and one may search a good while before finding a handsomer insect. It is not difficult to capture, flying leisurely from flower to flower in search of honey. It is very abundant at times in the southern states, coming as far north as Virginia and the southern part of Illinois. It is also found on the Pacific coast in southern California. The larva is light yellowish brown striped with dark brown and covered with black branching spines. It feeds on the passion vine.

The genus *Colenis* has very long and narrow upper wings, resembling in this respect the genus *Heliconia*. The insects are mostly brownish orange, but one very beautiful species, *Colenis dido*, is



UPPER SIDE



UNDER SIDE

ARGYNNIS MYRINA



UPPER SIDE



UNDER SIDE

AGRAULIS VANILLAE



UPPER SIDE



UNDER SIDE

EUPTOIETA CLAUDIA



Upper side.



Under side.

COLÆNIS JULIA.







Upper Side



Under Side

COLAENIS JULIA

green and dark brown. They are inhabitants of tropical America and the West Indies, and but two species range as far north as southern Texas. The more strikingly marked of these is *Colænis julia*, of which figures are here given. It is brownish orange, and sometimes, when fresh and perfect, almost red. The wings are margined with black, and a bar of black extends diagonally across the outer and upper portion of the upper wing. Beneath it is tan or rust color with a few darker shades. One or two faint red spots are located near the base of both wings.



Colænis delila.

Our other native species, *Colænis delila*, closely resembles the preceding species, but is without the black markings across the wings, and is paler in coloring. These two insects are very abundant in Mexico, and one rarely receives a box of butterflies from that country which does not contain several specimens.

The genus *Danaïis* comprises a large number of good-sized butterflies inhabiting almost all portions of the world. Many of the grandest species are natives of southern Asia and the Malay Archipelago. The ground color of these insects is often brownish orange or reddish brown, while in some of the handsomer species it is green or blue. This color is usually diversified with bars and lines of black, these frequently following the veins and margins of the wings. These butterflies are supposed by naturalists to be protected from their enemies by a rank odor and a bitter taste, so that they have been in a large measure exempt from the attacks of birds and other

insect-eating animals. On this account they fly boldly forth, making little or no effort at concealment.

These protected insects have been the subjects of unconscious imitation or mimicry by butterflies belonging to other groups less favored by nature, and many of the species are so exactly copied both in coloring and also in habits as not only to deceive the birds but also the collectors.

One of our largest and best known butterflies belonging to this genus is *Danais archippus*. The larva feeds on the milkweed, and is



Larva of *Danais archippus*.

a prettily marked creature, being banded transversely with black, yellow and green, and having two long black fleshy horns or filaments at either end of the body. It is easily reared in confinement, and the chrysalis, which is translucent pea green relieved with a line of black dots across the back and rows of circular spots of burnished gold



Chrysalis of *Danais archippus*.

about the thorax and along the sides, is an object rarely equalled for beauty in art or nature. The butterfly makes its appearance about two weeks after the chrysalis is formed, the color of the wings being plainly visible through the thin chrysalis shell for a day or two before



Upper Side



Under Side

DANAUS ARCHIPPUS



it emerges. When seen in the sunshine in the height of perfection, the wings show pleasing iridescent tints varying from green to blue and purple, or even red. This insect is rarely seen in the northern part of our country before July, as it is supposed that neither the perfect insect nor the egg or chrysalis is able to withstand the rigors of our winter, and that the first specimens to be seen in our region are migrants from the south. This is not strictly true, for on several occasions both my brothers and I have taken this butterfly early in May in New England, proving that occasionally the insect succeeds in weathering our severe winter either in the chrysalis or mature state.

At times during September or October immense numbers of these butterflies are seen in scattered flocks apparently migrating either in search of food or toward a warmer region. I have never been so fortunate as to witness one of these flights, but from a gentleman residing in northern Illinois, who saw such a migration in 1894, I obtained the following facts: The butterflies were very abundant near Chicago in that year, and toward the last of September they formed immense flocks and might be seen every afternoon streaming in a southeasterly direction. One evening thousands collected on a dead tree near this gentleman's house, completely covering its twigs and branches.

A good many other kinds of butterflies have been known to assemble in flocks of countless thousands, and have even been observed many miles at sea flying high in air.

The geographical range of this *Danaïs* is very great, being now distributed over a large portion of the earth's surface, although it was originally a strictly American species. It is now common in the Sandwich Islands, Samoa and most of the islands of the Malay Archipelago, while it is plentifully distributed over Australia. These distant lands have been colonized by it only within very recent years. This butterfly with many others has been placed in a new genus and given a new specific name within recent years, and now by many collectors goes by the title of *Anosia plexippus*; and right here I wish to write a few words in regard to the scientific names of insects and the changes which are being made by almost every new writer on the subject of entomology. This constant change of name and the almost endless separating of the species into new genera is one of the most senseless as well as the most needless obstacles put in the way of those who desire to acquire a knowledge of ento-

mology. A child begins by hearing the names of a few of the common insect forms about him, and no sooner does he begin to get a little familiar with them than some new book comes out on the subject and he runs up against an entirely new nomenclature, either of genera or species, or both, which is well calculated to discourage the most ardent enthusiast. Better almost any name that shall permanently stand for the species than this constant change. If authors were agreed among themselves one might conclude that there was some system to their madness, but when one author calls an insect *Limenitis disippus*, another *Limenitis misippus*, another *Basilarchia disippus*, and still another *Basilarchia archippus*, it is enough to bewilder and disgust the hungry aspirant for knowledge on the subject. Even the common names have stuck better in many instances than those given by the scientists, and one has often to resort to them to avoid confusion. Let us hope that order will eventually come out of all this chaos, and that those who tinker with the names and classifications may call a halt before they make a separate genus for every species, and the scientific names to each are more numerous than the legs of its caterpillars. In studying exotic insects, especially those from little-known lands, one is spared these changes of names to a great extent, for it is frequently our most common insects which have three or four scientific names. Let us aim to get these names anchored, and when once a name is well established to hold to it instead of following the caprice of each new writer who may have little more to attract attention than a renaming and reclassification of our familiar forms. To be able to glibly articulate long scientific names and to be familiar with the most recent classifications does not constitute a knowledge of natural history. A thorough understanding of the habits of an animal learned through search and observation is of much more value than a knowledge of its most recent name, which may be a very temporary affair.

One other native insect of this genus is *Danaïs berenice*. It is a rather plainly-colored insect, being yellowish brown, sometimes reddish brown, the wings being margined with wide bands of black in which are enclosed numerous small white spots. Several larger white spots adorn the outer portion of the upper wings. The under side is colored much like the upper, except that on the lower wings wide lines of black follow the veins. This insect is very abundant in Mexico, and extends its habitat up into Texas and Arizona.



Upper side.



Under side.

DANAIS BERENICE.

An insect varying slightly in the coloring of the lower wings and having the veins margined with grayish white has been given the name of *Danais stigosa*. As these two forms blend into one



Danais stigosa.

another by insensible gradations, so that among a dozen specimens all collected in the same locality it may be impossible to state to which some of them belong, one would naturally conclude that they were the same species with slight color variations.

Heliconia comprises many very beautiful insects of medium size, having very long and narrow upper wings, comparatively small lower wings, long bodies, and long, knobbed antennæ. They give off a powerful odor when handled, and on account of their bitter taste are avoided by birds and other insect-eating animals. Their home is tropical America, where they abound in great numbers both in species and individuals, their bright colors of red, yellow, blue and green in sharply outlined patches and bars on a usually black ground enlivening the dark forests, and partly compensating for the lack of brilliant flowers in those regions. Their caterpillars are spiny, and their chrysalides are angular, and, according to various observers, emit a squeaking noise as they bend from side to side when disturbed.

An interesting habit of butterflies belonging to this genus was witnessed by one of my brothers, William Denton, in Colombia, South America. One day, while he was out collecting, he noticed several male specimens of a very handsome species fluttering about a bush by the roadside. These he took with his net, and was about to move on, when other specimens were seen approaching. In a short time he had several more, but still they kept coming to the same bush. This excited his curiosity, and upon carefully examining the bush he discovered a number of chrysalides of the female of this species upon it, the butterflies within being plainly visible and almost ready to burst their shells. The males were already assembling to welcome the females on their emerging from their chrysalides.

Heliconia charitonia is our only native species of this genus, but it is a handsome insect, as one may see by reference to the plate. This butterfly is abundantly found in Mexico and Central America, and occasionally it may be seen in numbers in southern Florida, where it flies lazily in the hot sunshine. Like the different species of *Agraulis*, the larva of this insect feeds on the passion vine.

Two beautiful insects belonging to the genus *Eumenes* inhabit the extreme southern portion of our country.



Eumenes atala.

Eumenes atala is a common insect in southern Florida early in February, where it may sometimes be seen by dozens clustered on the flowering plants. It is usually very abundant near Miami in that state. The wings of this insect are black with streaks of metallic green or blue below the upper margin of the upper pair,



UPPER SIDE



UNDER SIDE

HELICONIA CHARITONIA



while a row of spots of the same color follows the outer margin of the lower wings. Beneath, the color is black, the upper wings plain, while the lower ones are adorned with many brilliant metallic



Eumonia atala. Under side.

green spots, and one large red spot located midway on the inner margin. The head and thorax is black with metallic green streaks, and the abdomen is brilliant orange.

The other species, *Eumonia minyas*, occurs in southern Texas, and is much like the preceding species except that it is larger. I have never received a specimen from this country, those I have having been captured in Mexico.

A very small reddish brown butterfly, adorned with metallic blue spots arranged in irregular transverse rows on the wings, is *Calephelis cænius*. It is a native of Florida and the gulf states, and occasionally strays as far north as Virginia. I have never seen the insect alive, and know nothing of its life-history or habits.

PAPILIONIDÆ.

Whitelings, Yellows, Swallowtails.

WE now arrive at a large group of butterflies having six well-developed legs, and where the chrysalis is attached to its support, not only at the extremity of the abdomen but by a thin line or thread of silk passing round the middle of the body, which, except in the genus *Ornithoptera*, usually holds it in a horizontal position instead of its being suspended in a perpendicular position, head downward, as in the *Nymphalidæ*. The larva is long, usually tapering toward the anal extremity, frequently ornamented with brilliant colors, and in the genera of *Ornithoptera* and *Papilio* is provided with a protective scent organ placed at the back of the head which can be protruded at the pleasure of the animal. This organ is forked and is usually extended when the insect is irritated.

To this group of butterflies belong many of the largest and most grandly colored Lepidopterous insects of the world. It comprises the magnificent butterflies belonging to the genus *Ornithoptera*, specimens of which frequently expand seven or eight inches between the tips of their velvety wings, and the regal *Papilios* or swallow-tailed butterflies, wherein the lower wings are usually prolonged into tails at their lower extremity, and which in the coloring of many of the species are incomparably beautiful. It also includes a host of species belonging to the family *Pierinæ*, so familiar to every one, and having white or yellow for the principal color of their wings.

To the genus *Colias* belongs a large number of species of medium-sized butterflies widely distributed over the northern hemisphere. They are among our most common butterflies in the United States, and are familiar objects to every one who has an opportunity to see the fields and meadows in summer. Their colors are various shades of yellow or orange with heavy black borders to the wings in the males, while in the females their coloring is less sharply defined and not so heavy. The caterpillars are cylindrical, long, and taper slightly toward their posterior extremity, and are green in color, feeding largely on clover. Their chrysalides are pointed at the

CHAPTER I



The first meeting of the Royal Society was held on 28th December 1660, at Gresham College, London. It was the first of a series of meetings which were held in the hall of Gresham College, and which continued until the year 1673, when the society removed to the hall of the Royal Society, in the Strand. The society was then known as the Royal Society of London, and its members were called Fellows of the Society. The society was founded by a group of natural philosophers, who were united by a common interest in the study of nature, and who were determined to promote the advancement of science and the improvement of the human mind. The society was the first of its kind in the world, and it has since become one of the most important and influential organizations in the history of the world.

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UPPER SIDE



UNDER SIDE

COLIAS PHILODICE

head, have a convex breast and a hump on the thorax. Many of them are green in color.



Colias philodice. Male.

Our best known species of this genus is *Colias philodice*, an insect which ranges over the whole of our country east of the Rocky Mountains. It is common in summer in almost every field, and may be seen by dozens quietly resting with wings erect, sucking



Colias philodice. Female.

the moisture from the muddy pools in the roads. A good many varieties occur, and one may find many albinos and also dark rich specimens if the trouble be taken to search for them. The caterpillar feeds on the clover. It is grass green and striped with light green.

Several broods of this insect make their appearance each season, so that it is rarely absent from our fields in summer.



Colias philodice. Female, albino.

Colias eurytheme has much the same habits as the preceding, except perhaps that it is more agile on the wing. It is found in the middle



Colias eurytheme. Male.

and western states in abundance, and even extends across to the Pacific coast. It also occurs in New England, though I have never known it to be common there. Its bright orange colors make it a conspicuous object while on the wing. The species is very subject to variation in color and size; some specimens are intense orange, while others are yellow, scarcely showing a tinge of the orange.



UPPER SIDE



UNDER SIDE

COLIAS EURYTHEME



Albinos, looking much like the albinos of the preceding species, are not rare, and very dark insects are occasionally taken. In all its varieties it is an attractive insect, and the dark rich colored females are very beautiful. There are two or more broods in a season, the



Colias eurytheme. Female.

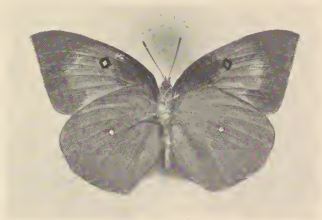
first making its appearance in May and others coming through the latter part of the summer and fall. It is most numerous in August in open fields and meadows, and neglected pastures where thistles and burdocks abound are its special delight.



Meganostoma cæsonia.

The genus *Meganostoma*, which closely resembles *Colias* except that the apex of the wing is more pointed, is represented throughout the region east of the Rocky Mountains by *Meganostoma cæsonia*.

The colors are black and yellow, the wings being frequently edged with a narrow line of pink. The rather vague and fanciful resemblance of the yellow patch on the upper wing to an animal's head has given the insect the common name of the dog's-head butterfly. The insect is yellow beneath, with spots as shown in the illustration.



Meganostruma caesonina. Under side.

The sexes differ little in coloring. This species is much more abundant in the south and southwest than in the east and north. I have never taken it in New England, but found a good many specimens near Iowa City, Iowa, in August. It is a good flyer, and one is obliged to move rapidly and use the net skilfully to capture many specimens.

A very beautiful species of this genus, *Meganostruma eurydice*, a native of California and the Pacific coast, displays in the male insect bright pink and purple iridescence almost dazzling to the eye.

The genus *Gonepteryx* contains some large and very showy butterflies. The shape of the wings is peculiar, in that they are angular and look as if trimmed with the scissors, the upper wings having the upper margin strongly bowed and ending in a blunt point, while the lower pair have a decided point midway on the outer margin. The veins of the wings are large and raised, and from the under side the insect bears a striking leaf-like look. But two of the large and handsome species of this genus are found in this country north of Mexico, and they must be regarded as stragglers from more tropical climes.



Upper Side



Under Side

MEGANOSTOMA CAESONIA



UPPER SIDE



UNDER SIDE

CONOPTERYX CLORINDE



Upper side.



Under side.

GONEPTERYX CLARINDE.



UPPER SIDE



UNDER SIDE

ONEPTERYX MAERULA

Gonepteryx merula is a large and handsome species, and is of a very pure citron yellow with a conspicuous black dot above the middle of the fore wing and a few faint dark spots along the outer



Gonepteryx merula.

margin. It is a striking object on the wing and is common in the warmer parts of Mexico.

The other species, *Gonepteryx clarinde*, is almost white with a bluish green shade. A long yellow patch, beginning near the middle of the upper margin of the upper wing, extends half way across the membrane. It includes in its outer margin a black spot surrounded by a ring of orange. A small dark spot is located near the centre of the lower wing, having an orange ring surrounding it also. Beneath, the insect is light green, the lower half of the upper wings being almost white. Faint buff lines extend along the larger veins, and a fine stipple of this color may be seen on the membranes if closely inspected. The dark spots of the upper side are faintly indicated by a pinkish shade beneath. The strong raised veins of the under side are undoubtedly a protection to the animal when at rest, as it is very leaf-like in appearance. This butterfly is common in the

warmer parts of Mexico and Central America, and many specimens annually find their way to this country with collections of dried insects in papers. It is a good flyer, but like many of its near relatives is very fond of alighting on the wet mud of roads or the banks of streams.

A plain yellowish white insect, about the size of or a little larger than our common yellow butterfly, and inhabiting Florida and the gulf states, is *Kricogonia lyside*. While the female is almost an even shade of yellowish white, the male has a yellow patch at the base of the upper wings and a darker shade at their tip. A conspicuous dark spot is located just below the upper margin of the lower wings. I have never seen this insect alive and know nothing of its habits.

Callidryas contains several bright and gaudy butterflies of various shades of orange or yellow. Some of the species are of good size, and



Callidryas eubule. Male.

on account of their clear and pure colors are showy objects when flying or preserved in one's cabinet. The genus is represented by species from many parts of the world, but those from Mexico and Central America are among the finest.

One of our best-known species is *Callidryas eubule*, an insect which is plentiful in the south and not infrequently is to be seen in New Jersey and southern New York. Its brilliant yellow color and



Upper Side



Under Side

CALLIDRYAS EUBULE

its size render it conspicuous as it flits across the fields. It is a good flyer, and the young collector will need to use his legs as well as his net to capture it. The male insect is of a plain lemon yellow and is



Callidryas eubule. Female.

without markings above, having a few small, faint reddish brown spots beneath. The female has a dark brown spot above the middle of the upper wing and several light brown spots along the outer margin. The caterpillar is green, and feeds on the cassia.



Chrysalis of *Callidryas eubule*.

The chrysalis is very peculiar in shape, being concave at the back and extending out into a wide flat keel or ridge on the breast.

The insect ranges from the latitude of New York City, in the United States, south through the whole of Central and South America to Patagonia.

An insect second to none of the family in showy coloring is *Callidryas philea*, which, with its large size and its brilliant yellow



Callidryas philea. Upper side.

and orange wings, is one of the gayest of butterflies. The home of this creature is tropical America, but it strays into the southern states of our country and is not rare in Texas. It is very abundant in the low lands of Mexico, and my brothers found it numerous in Colombia, South America, although always a difficult insect to capture on account of its strong and rapid flight. The ground color is bright yellow with a large orange patch extending from the upper margin of the upper wings half way across them. A wide band of orange blending into the yellow follows the outer margin of the lower wings. Beneath, the insect is strong Naples yellow, lighter on the lower half of the upper wings.

Another fine insect is *Callidryas cipris*, in which the lower wings at their lower portion are carried out into short rounded tails. The ground color is bright yellow with a large area in the middle part



Upper side.



Under side.

CALLIDRYAS CIPRIS.

of the upper wings and a broad band on the outer margin of the lower pair, tinged with orange. This orange tint is sometimes



Callidryas philea. Under side.

almost wholly wanting. Beneath, the color is yellow, diversified with a stipple of brown and brownish orange, in places arranged in vague lines. A light spot above the middle of the upper wing is surrounded with a ring of brown, while two silvery spots similarly surrounded, adorn the lower pair. Seen either from above or below, the butterfly is very handsome. Like the last species, this butterfly is principally an inhabitant of tropical America, and is rare in the United States. Many glorious specimens come from the hot low lands of Mexico.

Callidryas argante is deep orange in color, lighter along the inner margin of the lower wings, and having a few brown markings along the outer margins of both sets of wings, more distinct at the apex of the upper pair. The color beneath is slightly lighter, but is variegated with a brown stipple arranged in indistinct wavy lines, very similar in pattern to the last described species. Two spots of silver are also present near the middle of the lower wings. This insect is only

found in the extreme southern portion of our country, but it abounds in Mexico and Central America.



Callidryas argante.

Another species or variety of the present species goes by the name of *Callidryas agarithe*. The insect is slightly lighter in its



Callidryas argante. Under side.

coloring, and the under side is not quite so profusely marked with the brown stipple. Otherwise it is indistinguishable from *Callidryas argante*, and occupies the same territory.



Upper Side



Under Side

CALLIDRYAS AGARITHE

The genus *Pieris* contains a large number of white butterflies of medium size, many of which are adorned with spots or markings of dark brown. Beneath, they are frequently yellowish white in color. The caterpillars are generally green, and feed on cruciferous plants, some of the species doing considerable damage.

The chrysalis is somewhat angular, usually light in color, and although naked and fragile, and usually exposed to every breeze that blows, it is capable of withstanding the severe frosts and storms of winter, and rides safely anchored by its silken threads. The insects inhabit chiefly the northern hemisphere of both the old and the new world.

Our most abundant species is *Pieris rapæ*. This insect is a European importation which has driven our native white *Pieris oleracea* almost out of existence. It is one of the most plentiful of butterflies, making its appearance early in the spring, and being two or even three-brooded in some localities. It has a wide distribution over our country and Europe. The larva of this butterfly is a great enemy to the market gardener and farmer, sometimes devouring his young cabbages and cauliflowers to such an extent that nothing but the bare stalks remain standing in the field.

The larva is green and covered with short down or fine hairs. The chrysalis is grayish or sometimes light green. This insect has gradually spread over the entire continent, and may be seen flying in swarms over fields of cabbages or turnips anywhere from Maine to Texas, New York to California, and no field of cruciferous plants is safe from its attacks.

The heads of the cabbages are often riddled and rendered worthless by the holes made by the larvæ, and to destroy them is not an easy matter. Catching the butterflies with a net when first they make their appearance and before they can lay their eggs on the young plants, is perhaps the best method of keeping their numbers down. The vigorous use of the net for an hour a day for two or three days at the right time, will so reduce the numbers of this pest that the plants will get a good start. This is preferable to using emulsions of any sort to kill the caterpillars, as they are apt to make the plants unfit for food, a matter of considerable importance to the agriculturist.

Pieris oleracea, a butterfly which not long ago was plentiful over a large part of the north-eastern United States, presumably owing to the introduction of *Pieris rapæ*, has now become very scarce except

in one or two localities, where it may still be found in some abundance. I refer to the White Mountain region of New Hampshire, and the Adirondack region of New York.



Pieris oleracea.

It is a delicate little creature varying from pure white to yellowish white streaked with gray on the veins above, while below the veins on the lower wings are margined by gray, and the tip of the



Pieris oleracea. Under side.

upper wings and all of the lower pair are yellowish. No less than ten different varieties of this species, each with its three scientific names, are recognized by entomologists. Let us hope that the Latin names may hold out to christen all the new varieties which may be discovered in the future, or that like this butterfly, the species-maker who manufactures new names by the wholesale may be started on the road to extinction by the law of the survival of the fittest.



PLATE I
THE BUTTERFLY
DORIS NIMPHALIS
L. (DORIS NIMPHALIS)
DORIS NIMPHALIS L.
DORIS NIMPHALIS L.



DORSAL VIEW

FIGURE 1. DORSAL VIEW OF THE BUTTERFLY DORIS NIMPHALIS L. (DORIS NIMPHALIS). THE BUTTERFLY IS SHOWN WITH ITS WINGS SPREAD, AND THE BODY IS CENTRALLY LOCATED BETWEEN THE WINGS.



VENTRAL VIEW

FIGURE 2. VENTRAL VIEW OF THE BUTTERFLY DORIS NIMPHALIS L. (DORIS NIMPHALIS). THE BUTTERFLY IS SHOWN WITH ITS WINGS SPREAD, AND THE BODY IS CENTRALLY LOCATED BETWEEN THE WINGS.



Upper Side



Under Side

PIERIS RAPAE

A pretty little species which inhabits the eastern half of the country is *Pieris protodice*. Like many of its near relatives its



Pieris protodice. Male.

larva feeds upon cruciferous plants, doing much damage to the growing crops, and when plentiful it is somewhat of a pest.



Pieris protodice. Male. Under side.

There is a good deal of variation in the species, and the sexes are unlike, the male being almost pure white with a few dark spots, while the females are clouded, and the veins on the under side are margined with lines of yellow. This insect is not common in New England, but in the west and south it may be seen flitting low over the fields, or on the blossoms of weeds during the summer and autumn.

The genus *Terias* is widely distributed over most parts of the world. It comprises a large number of butterflies of small



Pieris protodice. Female.

size, whose colors are mostly yellow or orange with black borders. Two or three species are very abundant in the eastern half of our country.

Terias lisa is a little butterfly, which, while on the wing, one might easily mistake for a small specimen of *Colias philodice*. It is thin and delicate, seemingly a very frail creature. It sometimes makes its appearance in great numbers, and has even been seen at sea many miles from land, where it doubtless had been swept by



Terias nicippe. Male.

strong currents of air. It is distributed over the whole eastern half of our country except the most northern part, and although



UPPER SIDE



UNDER SIDE

TERIAS LISA

not commonly seen in New England, it is very abundant in the south and west.

Like many of its near relatives there is a good deal of variation in coloring between specimens, and albinos are not rare. The caterpillar feeds on the cassia.



Terias nicippe. Male. Under side.

A bright and pretty insect, which is frequently so abundant in the south and west as to be a feature in the landscape, is *Terias nicippe*. The deep orange wings bordered with sharply defined bands



Terias nicippe. Female.

of black of the male insect contrast strongly with the pale orange or sometimes yellow clouded wings of the female. Considerable variation exists too, between individuals of the same sex. This butterfly actually swarms, in Tennessee at certain seasons, and I

recall with pleasure an early morning ride during August over the rich alluvial plains along the Mississippi River, where hundreds if not thousands of these insects were to be seen. As we jogged along over the country road, the dark, luxuriant, almost tropical forest on both sides, the scene was enlivened by these butterflies as



Terias nicippe. Female. Under side.

they rose in numbers from the grass, sometimes appearing like a small cloud about us. They were not wild, and soon settled again among the grasses by the road side. This insect is rarely seen further north than the latitude of New York City, and is most abundant in the southern states, whence it ranges south into Mexico, Central America and South America. The larva feeds on the cassia and clover.



Terias jucunda.

A tiny and very delicate creature is *Terias jucunda*. The colors are bright yellow and black, disposed as shown in the illustration, while the under side, particularly of the lower wings, is very light or almost white, the upper pair being light yellow bordered by light



Dorsal Side



Ventral Side

TERIAS NICIPPE

gray. This insect is abundant in the states bordering on the Gulf of Mexico. It is of feeble flight, keeping near the ground and seldom flying far at a time. Two or three other species of this genus closely resembling this one are found in the southern states. This species, however, is lighter beneath than the others.



Terias proterpia.

A butterfly belonging to this genus, of a deep orange color and with angular outlines to the wings, is *Terias proterpia*. Along the upper margin of the upper wing is a heavy black band shading into gray. This color is continued, although very faintly, on the outer margin of the lower wing. The veins of the lower wings and the outer portion of those of the upper pair are black. This little butterfly is found in Texas and Mexico, and I have a number collected in Colombia, South America. I have never seen the insect alive and can give no information as to its habits.

Some very prettily marked butterflies belong to the genus *Anthocharis*. They are small, frail creatures, weak in flight, their delicately tinted and rounded wings suggesting the petals of a flower. Their usual color is creamy white with brown markings. The tip of the upper wing is usually occupied with a brown patch, in the middle of which in many species is an orange or red spot. Others lack this orange spot except in the male insect, and others still do not have it in either of the sexes. The lower wings are usually margined with brown spots. The under side of the lower wings is mottled with green, giving them a mossy appearance. This mottling also occurs near the tip of the upper wings beneath, and the orange spot where present is sometimes reproduced below. The wings are very thin and the moss-like markings on the under side

of the lower wings is readily seen through them from above, where they appear as a gray shade. We have but two species in the eastern half of our country, but several very beautiful kinds are natives of the Pacific coast, where they are not rare.

I can remember one very delightful morning in May, many years ago, spent at what was then the gold mining town of Sonora, California. The gold has since been washed from the bed of the streams and the people have mostly turned their attention to agriculture. At the time of my visit it was the centre for a lively mining population



Anthocharis olympia.

and on going out to view the placer works, with their heaps of *débris*, the hundreds of pits and miles of flumes, I was surprised to see a number of these little butterflies flitting about the weeds which



Anthocharis olympia. Under side.

grew among the heaps of boulders. I straightway secured my net and after half a day of clambering over the rocks in the hot sunshine I filled my box with specimens in their papers. It was warm

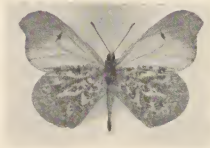
and fatiguing work, but I enjoyed it. The miners seemed to enjoy it too, for once when I missed my footing and rolled down a steep bank into a puddle of muddy water, a roar of laughter went up from half a hundred lusty throats. But I didn't care; they had their laugh and I had the butterflies. I only wish I now had a few of the dozens of beautiful *anthocharis* I captured that morning.

Anthocharis olympia has no orange spot at the apex of the forewing in either sex, but it is a very pretty little butterfly nevertheless. The upper side is creamy white with brown markings, arranged as shown in the illustration. the mottlings of the under side of the lower wings showing distinctly through. The under side is mottled with olive green on a white ground, giving a very pretty effect. It is found in Texas.



Anthocharis genutia.

Anthocharis genutia is found from New England south, although I have never seen it very abundant anywhere. This insect can be



Anthocharis genutia. Under side.

readily recognized by the hooked or falcate forward wing. It is very frail and of feeble flight. The insect is white, the tip of the forward wings of the male being orange, while in the female it is

spotted with brown without the orange. The under side is delicately marbled with olive green and brown.

I have taken this butterfly near Washington, D. C., where one



Anthocharis genutia. Female.

may collect half a dozen specimens in a day at the right season. It is one of our prettiest species, and nearly always attracts attention in one's cabinet.



Parnassius clodius.

An interesting group of butterflies is the genus *Parnassius*, in which the wings are so thinly covered with scales as to be partially transparent. The colors are light yellowish white with brown or slate colored markings and red or yellow spots, while they have a decidedly moth-like look from the amount of down or soft hairs on

the surface. The bodies of these insects are dark in color and very hairy.

The larvæ are dark colored, flattened beneath, and pass through their transformations on the ground, gathering a few bits of leaves or twigs into a loose cocoon, which is held together by silken threads.

These butterflies are all inhabitants of mountainous districts and are found both in the old world and the new. While we have no species of this genus in the eastern part of our country, they are found on the Sierra Nevada and Rocky Mountains as far east as Colorado.

There is great variation in the coloring of the specimens, individuals ranging from almost white with yellow spots to slate color with red spots. These insects are not difficult to capture, as they fly near the ground. I have never seen them abundant, and by collectors in this country they are generally considered most valuable specimens to possess.

In the genus *Papilio* are classed many of the largest and handsomest butterflies the world affords. The group reaches its greatest development, both as to the number of the species and the extraordinary beauty of their coloring, in southern India and throughout the islands of the Malay Archipelago, but we have many very fine species in our country and in Mexico and South America.

Rev. J. G. Wood, in writing of this group, says: "The genus is a very comprehensive one, including between two and three hundred known species, among which may be found almost every imaginable tint in every gradation and exhibiting bold contrasts of color which scarcely any human artist would dare to place together, and which yet produce a result equally striking and harmonious."

The group has been divided into several genera by some authors, and although the general characteristics of the species thus separated are not difficult to follow, they seem somewhat arbitrary, especially as there is a great similarity in the habits and development of the species of the whole group. Had there been but a few species of the various classes, instead of dozens or scores, the genus would probably have been left entire, much to the satisfaction and convenience of those who wish to acquire knowledge on the subject of entomology.

Many of these butterflies are supplied with tails or prolongations to the lower wings which add much to their beauty. In some these tails are long and narrow, in others short and wide, while a few of the species are destitute of tails. Their larvæ are fleshy, of various

colors, and some are supplied with soft horns or filaments growing from various parts of their bodies. At the back of the head of the



Metamorphosis of *Papilio*.

larva is situated a forked organ giving off a powerful odor, which is doubtless used as a means of protection against its various enemies. When not in use this organ is retracted and entirely concealed. The larvæ feed on various trees and herbaceous plants, but are

seldom sufficiently plentiful to do much damage. The chrysalides of many of the species are protected by their coloring, some being brown or gray and imitating bits of bark or decayed wood, while others are green, and when hidden among the leaves are very difficult to see.

According to Mr. Henry Edwards, "Twenty species, or at least strongly marked forms of true *Papilio* may be credited to the United States."

Papilio turnus is one of the largest and handsomest species of this group found within the borders of our country. It is an abundant insect over a large part of North America, but is replaced on the Pacific Slope by two or three allied forms not very different in size and coloring.

Specimens of this species vary greatly in size, ranging all the way from the small New England insects, frequently less than three and one-half inches in expanse of wings, to the magnificent creatures seen occasionally from southern Illinois southward, five and one-half or even six inches across. These large insects are often truly grand in coloring, and easily take a place among the princes of the butterfly world. In New England the species makes its appearance frequently as early as the middle of May, and is usually plentiful for three or four weeks. Stragglers may occasionally be taken during the latter part of summer and early in the fall, but the insect is single brooded, except possibly in the southern part of its territory.

When the foliage is fresh and green and the woods resound with the songs of birds and the hum of insect life awakened from its winter sleep, our beautiful tiger swallow-tail, as it is commonly called, delights to congregate about sunny openings in the forest, chasing each other high up among the oak leaves, or opening and shutting its gaily tinted wings as it alights on the lower shubbery. The butterflies are not very shy at these times, and one may quietly walk into their chosen playground without disturbing them. They frequently quit the forest in quest of sweets, and visit the cultivated fields. The syringa is one of their favorite flowers, and so intent are they on extracting the honey that one may frequently capture them with the fingers. With other species of butterflies they congregate in great numbers on the muddy banks of streams or lakes or at wet places in the roads, where one may take a dozen or more with one sweep of the net. A friend of mine tells of seeing a patch of these butterflies covering a space of several square feet, resting on the mud near a lake in northern New Hampshire, where he has been accus-

tomed to spend a part of each summer camping. Hundreds of these insects were congregated on the shore, and the birds, frogs and toads were reaping a harvest. They are usually exceedingly plentiful near Sunapee Lake, in New Hampshire, during the latter part of June, and make an interesting picture as they rise in a swarm from the lake shore on being disturbed. But they never look more rich and beautiful than when flying by twos and threes about in the sunshine with the fresh young leaves of the oaks for a background.



Papilio glaucus.

In the southern and western States a beautiful dimorphic form of the female only of this species may occasionally be taken. It is called *Papilio glaucus*, and a truly magnificent insect it is.

An idea of its size and shape will be had from the accompanying plate, but its rich black wings stippled with blue over a large part of



UPPER SIDE



UNDER SIDE

PAPILIO TURNUS

their surface, can be but partially appreciated from what is shown in the accompanying figure. The insect is so dark that it looks at first sight like a very large and fine *Papilio troilus*. A closer inspection reveals the true character of the creature, as the dark bands so conspicuous on the common form can be faintly seen on the under side of the wings of this variety.



Papilio glaucus. Under side.

The larva feeds on apple, birch and wild thorn, and is green in color, with two eye-like spots on the thorax. It resembles the larva of *Papilio troilus*, of which a figure is given on page 351. It is a rather difficult creature to find, and its chrysalis, which is usually attached to a twig or branch, is gray and brown in color and looks not unlike a piece of loosened bark.

Papilio rutulus very closely resembles *Papilio turnus*, and takes the place of that species on the western half of the continent. The females never assume the dark color of the dimorphic form of

Papilio turnus. My brother found this butterfly, with *Papilio zolicaon*, the western representative of *Papilio asterias*, very abundant at Franktown, near Washoe, Nevada, during the month of June.



Papilio rutulus.

In habits it much resembles its near relative in the east, and was taken in numbers with a decoy placed within reach of the net where the insects were at play.

Another very large and beautiful butterfly is *Papilio daunus*. It closely resembles *Papilio turnus* in coloring, but the points on the lower wings are lengthened into tails which add much to the beauty of the insect.

The species is most plentiful in Colorado, New Mexico and Mexico, but specimens have been taken in Kansas and Texas. The one here figured is from the City of Mexico, where it is not rare in March and April, then frequently visiting the flowers in the public squares. It is often seen flying high over the houses, but when feeding on the flowers is easily taken. Considerable variation

in coloring occurs, some specimens being almost orange, while others are light yellow.



Papilio daunus.

One has to use great care in removing these grand insects from the net, as the slender tails of the lower wings are easily broken.

An insect which looks a good deal like *Papilio daunus*, except that it is smaller and the bands of black on the margins of the wings are broader, is *Papilio pilumnus*.

The points or tails on the lower wings are even more marked than in *Papilio daunus* and the insect is of somewhat slighter build. It is a very beautiful butterfly, but is more a Mexican insect than properly belonging to our fauna. It is occasionally taken in Arizona and Texas.

A butterfly which looks as if it had in part borrowed its shape from *Papilio turnus* and its colors from our next species, *Papilio ajax*, is *Papilio eurymedon*. This insect belongs to the western half of the continent and is plentiful along the eastern base of the Sierra Nevada in June and July. The caterpillar resembles that of *Papilio turnus*.



Papilio ajax. Early Spring Form.

Having little similarity to, and therefore easily distinguished from our other species of *Papilio*, is *Papilio ajax*. Like so many of this fine family it is an exceedingly beautiful insect. Several varieties of the butterfly are recognized by naturalists, each having its own name, which were at one time supposed to be distinct species. It has been discovered, however, by careful observation that all the varieties may spring from the same set of eggs, those which emerge from the chrysalides early being the smaller and lighter and having short tails to the hindmost wings, those which hatch later being somewhat larger and darker, with longer tails, and those which are developed from the eggs and larvæ the same season being the larger, with wide bands of black and having long tails. The accompanying figures will give a clear idea of the differences between the varieties.





Upper Side



Under Side

PAPILIO AJAX



Late Spring Form.



Summer Form.

PAPILIO AJAX.

When fresh from the *chrysalis* with its velvety wings in the height of perfection, there are very few insects more beautiful than this. The graceful shape of the insect, with the delicately tinted green stripes across the wings between the bars of dark brown and black, and the touches of blue and red on the lower wings, make it exceedingly attractive, and the young collector is likely to feel a thrill of pleasure as he takes from his net the first perfect specimen. It is a rare butterfly in New England, but is occasionally taken in the lower Connecticut valley. Throughout the middle and western states, ranging as far west as the Rocky Mountains, and in the south, it is a common butterfly. I have had many small and brilliantly



Chrysalis of *Papilio ajax*.

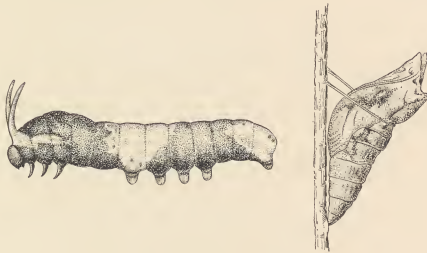
colored specimens from Florida and have collected large and fine ones in southern Ohio. Near Chillicothe, Ohio, it is exceedingly abundant during the summer, where it may be seen flying along the roads and paths by the river or alighting in the fields of clover.

A week's collecting during July, on the banks of the Little Miami River, near Fort Ancient in southern Ohio, where I procured, among others, many grand insects of this species, I remember as one of my pleasantest experiences in butterfly hunting. It is a grand locality for collecting, and the fertile valley, with its groves of large forest trees and fine farms, makes it an ideal spot for a short stay. The butterflies were most numerous along the banks of the little river and *Papilio ajax*, with its tails looking like streamers attached to its lower wings, was one of the most abundant species.

The food plant of the larva is the paw paw, and with caution the female butterfly could be approached and watched while she deposited her eggs singly on the under side of the leaves. The plants

selected for this purpose were usually the low bushes not over a foot or two high, and three or four of the light green larvæ were sometimes seen quietly feeding on one bush. Toward evening the butterflies collected about the paw paw bushes and settled for the night clinging to the under side of the leaves, where early in the morning they might be taken with the fingers. Many of the transfers of this species for this work have been made from butterflies taken in southern Ohio. It is not difficult to rear this insect in captivity. Some of the chrysalides are light green and others brown, and are translucent until the butterfly begins to form beneath the outer shell.

Several very beautiful species closely allied to *Papilio ajax* are natives of Central and South America. In Colombia my brothers took some of the largest and finest of the group, specimens of which now adorn our cabinets.



Larva and chrysalis of *Papilio cresphontes*.

One of our largest and most strikingly colored butterflies is *Papilio cresphontes*, a very good idea of which may be had by reference to the transfer.

The contrast between the upper and under side of the insect is very marked, and when on the wing the butterfly looks black at one moment and yellow at another, according to which side of the wings is seen by the observers. The home of this fine butterfly is in the southern and western states, but it is sometimes to be found in the north and several specimens have been taken near my home in Massachusetts within the last few years. It is abundant in southern Illinois in July, and is not at all rare in southern Ohio at that season of the year. On looking out of the car window as the train stopped for



UPPER SIDE



UNDER SIDE

PAPILIO CRESSPHONTES

a few moments at the small station of Fruitland, near Lebanon, Ohio, some years ago, I was a good deal surprised to see a clover field near by alive with this insect. They were flying in dozens over the field and opening and closing their wings as they rested on the clover blossoms sipping the honey. In the southern states and Mexico this is one of the commonest of butterflies.

The larva feeds on the leaves of the orange and lemon trees and at times is sufficiently plentiful to do some damage. It is a large and formidable looking creature, being purplish brown in color, with large patches of light yellow disposed as shown in the accompanying illustration. The chrysalis looks a good deal like that of *Papilio asterias* in shape, but is larger and rougher and is mottled with brown, purple and yellow.



Papilio thoas.

Closely allied to *Papilio cresphontes* and looking a good deal like it is *Papilio thoas*. The two species are easily separated, *Papilio*

thoas having longer and more slender tails and a wide yellow band on both sets of wings, while the row of yellow spots between the yellow band and the outer margin of the upper wings in *Papilio cresphontes* is often wanting in this species. The butterfly inhabits Mexico



Papilio thoas. Under side.

and Central America, where it is abundant. It is sometimes taken in Texas. The caterpillar, like that of the preceding species, feeds on the lemon and orange.

Papilio asterias appears in May and June and again in August. It is a handsome butterfly and one which will early attract the attention of the young entomologist.

The different stages in the life of this insect are shown on page 334.

The eggs are laid by the female on the young plants of the carrot, parsley, parsnip, etc.

When young, the larvæ are black, with a white band across the

middle, and orange spots on the sides. They change their color at each moult and on reaching maturity are light green, with bold black bands, which partly enclose a number of bright yellow spots. Upon being disturbed, the larva protrudes a forked scent organ from just back of its head, which gives off a disagreeable odor. This organ is orange in color and by the manner in which it is used, one might suppose the insect to be venomous. Except, however, for the havoc which the insect sometimes makes in the vegetable garden, it is harmless.

The caterpillars are exceedingly subject to the attacks of parasites, and it frequently happens that from one hundred of them, one will obtain but half a dozen butterflies.

An interesting account is given by Mr. Harris in his "Insects Injurious to Vegetation" of the manner in which the larva of this species prepares for its change into the chrysalis state and its hatching into the butterfly. He says, "The caterpillars usually come to their full size between the 10th and 20th of July and then measure about one inch and a half in length. After this they leave off eating, desert the plants, and each one seeks some sheltered spot, such as the side of a building or fence, or the trunk of a tree, where it prepares for its transformation. It first spins a little web or tuft of silk against the surface whereon it is resting, and tangles the hooks of its hindmost feet in it, so as to fix them securely to the spot; it then proceeds to make a loop or girth of many silken threads bent into the form of the letter U, the ends of which are fastened to the surface on which it rests on each side of the middle of its body, and under this when finished it passes its head, and gradually works the loop over its back so as to support the body and prevent it from falling downwards.

"Though it generally prefers a vertical surface on which to fasten itself in an upright position, it sometimes selects the under side of a limb or of a projecting ledge, where it hangs suspended, nearly horizontally, by its feet and the loop.

"Within twenty-four hours after it has taken its station, the caterpillar casts off its caterpillar skin and becomes a chrysalis or pupa of a pale green, ochre yellow or ash gray color, with two short, ear-like projections above the head, just below which, on the upper part of the back, is a prominence like a pug nose. The chrysalis hangs in the same way as the caterpillar and remains in this state from nine to fifteen days, according to the temperature of the atmosphere,

cold and wet weather having a tendency to prolong the period. When this is terminated, the skin of the chrysalis bursts open and a butterfly issues from it, clings to the empty shell till its crumpled and drooping wings have extended to their full dimensions and have become dried, upon which it flies away in pursuit of companions and food."



Papilio asterias. Male.

Mr. Harris, I think, errs in stating that the larva spins a silken girth and then "gradually works the loop over its back," as those which I have watched during this performance have spun the girdle from side to side *over* the body, bending the head backwards and attaching the thread of silk on each side, repeating the operation until the loop was sufficiently strong to hold its weight.

So plentiful are the chrysalides at times that I have taken dozens of them from the underside of the capping board of a fence which bounded a neglected field of carrots, where the plants had been stripped to mere stalks by the caterpillars. This butterfly is often seen in company with other species along country roads, but is not an easy species to capture, being rather shy and flying rapidly when alarmed.



Upper Side



Under Side

PAPILIO ASTERIAS

If one desires to rear it in numbers, a female should be captured and induced to lay her eggs on a bunch of the food plant, and when the young caterpillars appear they should be fed with tender shoots and protected from the parasites.



Papilio asterias. Female.

There are two broods in one season, and the last, after hatching into larvæ and turning to chrysalides, hibernate during the winter in this state.

The male and female butterflies may readily be distinguished from one another, the former being usually smaller and more strikingly marked, with the yellow spots brighter and more sharply defined. The female frequently lacks the inner row of large yellow spots seen on the upper wings of the male, they being sometimes reduced in size or wholly wanting, while the lower wings are usually adorned with more blue than is to be found on the wings of the male.

Beautifully colored varieties of this butterfly are occasionally taken, where yellow and rusty red occupy a large part of the area of the wings.

The insect inhabits the whole of the United States east of the Rocky Mountains, and the southern part of Canada.

Papilio zoliceon resembles *Papilio asterias* in size and shape, but has much more yellow on the wings, the spots having widened and lengthened out into wide bands crossed by the dark lines of the veins.



Papilio zoliceon.

This insect inhabits the western half of the continent and is plentiful in California, where it has much the same habits as *Papilio asterias*, the larvæ feeding on the same plants.

Another insect somewhat resembling *Papilio asterias* but having much more black than the preceding species is *Papilio indra*. The tails, however, are very short and the yellow spots are lighter and run more together than in either of the other species.

It is an inhabitant of the western half of the continent and was taken in some numbers by my brother on the mountains in California.

A large and showy butterfly is *Papilio troilus*. This insect is common throughout the eastern half of the continent during the summer months and is familiar to every collector. It somewhat resembles the female of *Papilio asterias*, but can be readily distinguished from that insect by observing the red and yellow spots on the under side of the wings, which are duller in color and more

nearly round than in *Papilio asterias*. There are also several other well-marked characteristics by which the insects may be separated.



Larva of *Papilio troilus*.

The female deposits her eggs singly on the leaves of the spice bush and sassafras, and the young larva is no sooner out of the egg than it begins to prepare a habitation for itself where it shall be safe from the prying eyes of the insect-eating birds. This is constructed in the following manner. Selecting a suitable leaf of its food plant, the larva commences to spin a fine web backward and forward across the middle portion of the leaf. As this web is stretched tightly, the



Chrysalis of *Papilio troilus*.

sides of the leaf soon begin to fold over and as the web is added to, they finally come together over the back of the insect, entirely shielding it from sight. Unlike some of the larvæ of other butterflies, which no sooner complete a home than they make their first meal off the leaves which compose it, this insect rarely or never nibbles its habitation, but keeps it in the perfection of good order and neatness. It rarely ventures forth during the daytime, but remains quietly resting upon its silken cot and at evening cautiously crawls out to feed upon the surrounding foliage. As the larva grows the

smaller home is exchanged for one more suited to its size, and it is not an unusual thing to find three or four leaves still green and perfect which have successively housed the same caterpillar.

The body of the larva is thick toward the anterior end, gradually tapering from the fourth segment backward.

Mr. Saunders, in describing a caterpillar of this species, which he found rolled up in a leaf of the spice bush, says: "Its length was about one and three-fourths inches, the body being thickest from the third to the fifth segments. The head is rather small, flat in front, slightly bilobed, dull flesh color, with a faint tinge of brown. The body is bright pea green, with a yellow stripe across the anterior part of the second segment, edged behind with dull black. On the fourth segment are two prominent eye-like spots, of dull yellowish or yellowish buff, encircled by a fine ring of black, and a large black pupil filling most of the lower portion. The posterior portion of this black pupil is encircled by a shining bluish black ring, the anterior portion of which strikes a little beyond the middle of the pupil; there is also a line of black in front of the pupil extending nearly across the yellow portion, and a pale pinkish spot in the upper part of the yellow which is edged with a slightly darker shade. On the fifth segment are two large irregular spots of the same color, pale buff, encircled by a faint ring of black, and having a faint pinkish spot on the anterior portion of each. These spots are nearer to each other than those on the fourth segment, a portion of the space between the fifth and sixth segments being deep black. Each segment, from the sixth to the eleventh, inclusive, has four blue dots, encircled with black, those on the seventh, eighth and ninth sometimes being largest. On each side, close to the under surface, is a wide yellow stripe, gradually softening into the green above, and edged below with blackish brown. Immediately below the spiracles is a row of blue dots edged with black, one on each segment, from the sixth to the twelfth, inclusive. The under surface is dull, pale greenish or yellowish white, having a decidedly reddish tinge as it approaches the yellow stripe on the sides. The feet partake of the same general color."

It is a plump, good-natured looking creature, and when fully grown is one of the handsomest of caterpillars. The eye-like spots have a droll, almost half-reproachful look, as if they expected you to beg their owner's pardon for taking the liberty to expose him to the daylight.



UPPER SIDE



UNDER SIDE

PAPILIO TROILUS

The caterpillar is easily reared in captivity, the chrysalis, if found in the autumn, remaining unchanged until the spring.

It is wood brown and has two ear-like projections on the anterior end. It is suspended by its posterior end, with a silken girdle about



Papilio palamedes.

its body, frequently in an upright position, and from a twig or branch. The butterfly is frequently seen in clover fields, where it may be closely approached as it thrusts its tongue into the tiny blossoms composing the heads of clover.

Specimens vary a good deal in size, but are surprisingly uniform in color, and among hundreds of specimens one will rarely find an insect showing great variation from the prevailing tints. The sexes, too, except for size, the females usually being the larger, are much alike.

Papilio palamedes is another grand butterfly. It inhabits Florida

and the gulf states, and occasionally strays as far north as Virginia. It is rich dark brown above, with light yellow spots. Below it is somewhat lighter, with faint yellow spots on the upper wings and two rows of orange spots on the lower pair. This insect is plentiful during March in southern Florida. Its larva feeds largely on the orange.



Papilio palamedes. Under side.

An insect of rare beauty and one of the finest of our native species is *Papilio philenor*. It is a widely distributed butterfly, being found over almost the whole of the continent from Massachusetts southward, and extending from the Atlantic to the Pacific coast.

Like many other species, it is exceedingly variable in its abundance, and although usually rare in New England, was three or four years ago, one of our most common *Papilios*. Our eastern specimens were, however, a good deal smaller and less beautiful than the grand



UPPER SIDE



UNDER SIDE

PAPILIO PHILENOR

insects found in the southern and western states. While fishing on streams in the west I have often seen this butterfly resting on the



Larva and chrysalis of *Papilio philenor*.

muddy banks, or flying leisurely along the wooded shores, the polished surface of its dark blue and green wings flashing in the sunlight and adding materially to the beauty of the scene.



Papilio polydamas.

It is often attracted to the flowers of the garden, and clover fields are a favorite haunt. In such places it is easily approached.

The larva feeds on the leaves of the pipe vine, or Dutchman's pipe, as it is more commonly called, and is a remarkable looking creature, being dark brown in color or sometimes even black, with rows of reddish spots and having many fleshy filaments or soft horns protruding from different parts of the body. The chrysalis is pink and brown, with mottlings of yellow on the back.

Papilio polydamas is easily recognized by its lack of the tails on the lower wings so characteristic of the genus *Papilio*. This insect inhabits Mexico and Central America and the West Indies, but is also found in Florida and Texas.



Papilio polydamas. Under side.

The predominating color is black with blue and green reflections, although less striking in this respect than the preceding species. The single row of spots inside the margins of the wings is yellow. Below the wings are brown, with the outer half of the lower pair black. A row of rusty red spots extends along the outer portion of the lower wing, and outside of this are several small silvery spots. A row of light yellow spots crosses the upper wings and both wings are margined with narrow, light yellow spots.

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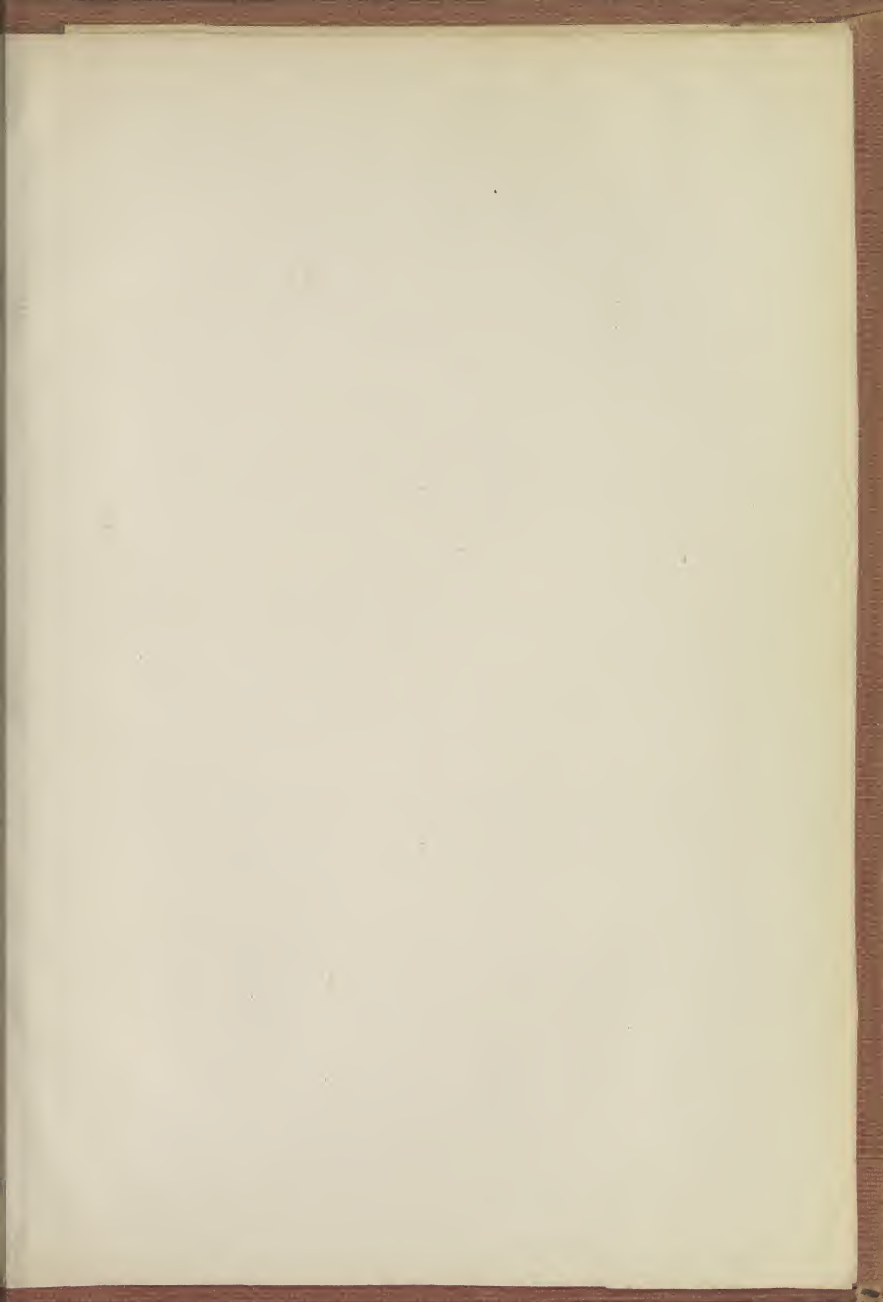
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