SUMMER LEPIDOPTERA.

By H. DOLLMAN.

'Tis summer again. From yonder copse the cuckoo greets its mate, immediately without the window sits a song-thrush giving forth its clear and liquid note, as if for pure joy that spring has come. All Nature seems to bid us come to greet her, so for the time let us be her guest, and study her in one of the most beautiful of her phases. As we stroll gently down the winding lane toward the copse, the copse from which we heard the cuckoo call, a white butterfly breaks suddenly from a patch of dead nettle, and then, seeming to understand that we intend no harm, settles again. Let us approach gently, and the timorous creature may allow us to observe it for awhile. But where has it gone? We saw where the butterfly settled, and yet it has now disappeared, although we are sure it has not flown away. Suddenly the sun shines forth again, and behold! our white butterfly gently flits from the very spot we have but lately searched in vain. Now for what have we been looking? Probably for a pure white butterfly with all four wings fully expanded, as we are accustomed to see in the cabinets of entomological friends. But when "the white" settled on the grass it folded its wings one against the other above the body, and thus, if looked at from immediately in front, shows but as the thickness of a narrow blade of grass. Neither is it the snow-white color we expected, for the under-side of its wings is of a yellowish white color, tinged with pale green, somewhat the color of young grass blades with a high light upon them. Thus has Nature already instructed us in one of the many methods she has for protecting her progeny. The white butterfly may have been one of two species, either the common white (*Pieris rapæ*; No. 1 in the first picture), or the green-veined white (*Pieris napi*). The latter differs from the former principally in having the veins of the wings more strongly indicated by gray-green scales, hence its popular name of green-veined white. The females of both *Pieris rapæ* and *P. napi* differ from the males in having an additional black spot on each anterior wing, and in having also many more dark-colored scales on both anterior and posterior wings in the region of the thorax. The interior wing on its posterior border has also a dark club-shaped mark in the female not exhibited in the male.

While we searched among the dead nettle for our white butterfly, we could not help noticing how its leaves had been devoured by some rapacious creature. Let us see if we cannot run this devastator to earth. No, he does not seem to be here. Let us look at that other patch of dead nettle yonder; perhaps that may harbor him. There he is, that large, black woolly-bear, sunning himself so luxuriously, evidently resting after his late display of voracity. What a fine big caterpillar it is, the long, black, glistening hairs and brown lateral tufts suiting him to perfection; but let us see if there are any more. Yes, on one small patch of pabulum we find five; no wonder the dead nettle look-

the various species of dock (*Rumex*), elm (*Ulmus campestris*), etc., being sometimes patronized.

There is another tiger moth caterpillar to be found in the springtime, though it is a little late for it now. It is the cream-spot tiger moth (*Arctia villica*; No. 1 in the second picture), and well worth our searching for, as perchance we may come across a late example. The caterpillar is found on grassy hedgerows similar to that from which we have just taken the common

TIGER MOTH CATERPILLARS.

woolly-bear; it likes to sun itself in little depressions among the soft grass where the sun is hottest. It is too late for it, I fear; we— Wait! Who is this crawling on the road? Surely it is a cream-spot! We are fortunate indeed; it is it, beyond all doubt. The clear, dark red legs and head are most distinctive, and the color of its hairs is not to be mistaken. It feeds on many low plants, such as groundsel (*Senecio jacobæa*), dandelion (*Taraxacum densleonis*), etc., and is far from a rare species, though not nearly as common as the garden tiger. We walk on through the narrow lane, discussing the various species of tiger moths, and ever and anon glancing at the hedge-bank to see if we can detect further spoils, when suddenly a rapidly-moving spot of sulphur yellow attracts our attention. It is a male brimstone butterfly (*Gonopteryx rhamni*) flying in the sunshine. The brimstone hibernates in the butterfly state, and is occasionally lured out even in the month of January by an especially propitious day, and seems very out of place among leafless trees and flowerless hedgerows. The female is considerably lighter than the male, being of a pale greenish white color instead of the characteristic brimstone yellow of the male. These hibernated specimens will soon have perished, when the females have finished depositing their isolated eggs upon the leaves or shoots of the buckthorn (*Rhamnus*). From these eggs our summer brood is produced, they in turn hibernating until the next spring. Other butterflies which hibernate in the butterfly state are to be found among the angle-wings (*Vanessa*), one of which, the small tortoiseshell (*Vanessa urticae*), we are almost certain to see flying over the nettles by the old barn at this corner. Let us go quietly. Yes! Do you see him?—settled upon that dandelion flower, a red and black fellow most easily perceived on the left in the fifth photograph. Its caterpillar feeds upon the stinging nettle (*Urtica dioica*), and, therefore, the hibernated examples are generally to be found flying around nettle beds in springtime, prior to oviposition. The nearest ally to the small tortoiseshell is the large tortoiseshell (*Vanessa polychloros*), a somewhat similar butterfly, but larger and more somber in color. It is generally found after hibernation flying round elms, the most usual food-plant of its caterpillar. It also feeds on willow (*Salix*). We may see other species of *Vanessa* before we end our walk, but let us look at this thick whitethorn hedge for a few minutes; there are two large caterpillars that we might find on it, those of the oak-egg moth (*Bombyx quercus*; on the left) and the lappet moth (*Lasiocampa quercifolia*; on the right of the fourth illustration). The oak-egg is soon found, and a pretty caterpillar it is, the velvety black of the segmental divisions contrasting well with the ochraceous brown of the segments. But beware of those innocent-looking hairs; they can produce a most disagreeable irritation of one's skin, somewhat akin to that of nettle stings, only far more durable, and for them "dock" is no antidote. This irritating property, also met with in other hairy caterpillars, is, no doubt,

of a strong protective value, serving a similar purpose as a nauseous taste. It is seen very well developed in the caterpillars of the gold-tail moth (*Porthesia similis*), another whitethorn feeder. It is necessary to search very carefully for the caterpillar of the other whitethorn-feeding species I mentioned (the lappet moth), inasmuch as it has a strong protective resemblance to the stems of the plant. It is a dorsiventrally depressed caterpillar, and lies quite flat along the branches, thus appearing as nothing more than an excrescence on the branch. Its color is also protective, being dark gray-brown with a few flecks of white about it, very similar in general effect to the color of a normally-colored branch. If the stems of the food are lichen-covered, there is a strong tendency toward a mottled yellowish green appearance, intermingled with the normal dark gray, thus closely assimilating with the lichen-covered bark. Similarly, if the branches of the pabulum are of a dark reddish brown hue, the caterpillar assumes a similar system of coloration. Besides the common whitethorn (*Crataegus oxyacantha*), it feeds on blackthorn (*Prunus spinosa*), buckthorn (*Rhamnus*), various species of *salix*, etc., and generally feeds at night-time, when it may be captured by searching the above-mentioned bushes with the aid of a lantern. Here we are at the copse at last. Let us take this broad ride leading through to the Wick farm road; it is gayly bedecked with cuckoo-flower, and we may therefore chance on an early orange-tip butterfly (*Euchloe cardamines*). For a moment we stop to watch a humble-bee fly as it poises itself in the air, quite motionless, then darts like an arrow toward some nectar-giving cup. A humble-bee fly—to me it is the emblem of spring! As we turn from watching it we see a male orange-tip butterfly gently flying past. He is marked No. 2 in the first photograph, and the female No. 3. She has not got those gay orange tips to her wings, but is far plainer, being not unlike a white butterfly, and apparently is much more rarely seen than her mate; this may, however, be largely due to the fact that she is so much less conspicuous. When her brief span of life is drawing to a close, she will deposit her eggs on the cuckoo-flower (*Cardamine pratensis*), from which eggs will emerge the small yellowish green caterpillars, that will rapidly mature, and hibernate as pupæ. When full fed, the caterpillar is green, and lies along the narrow seed-pod of its food, with which it assimilates extremely well, and to judge by the profusion of the butterfly, very efficaciously.

You saw that big butterfly that just passed us with the swiftness almost of a hawk; that was a red admiral—the soaring flight is very characteristic of a *Vanessa*. The red admiral (*Vanessa atalanta*), like the other *Vanessa* I previously mentioned, has passed the dreary months of winter in passive hibernation. Its caterpillar feeds on stinging nettle, and is to be found principally on nettle-beds by farm-buildings, etc.; he spins a leaf or leaves together, forming a small covered-in domicile, within which he lives, one would think fairly safe from his enemies. But, alas for him!

WHITES AND ORANGE-TIPS.

ed rather *passé*. They are the caterpillars of the garden tiger moth (*Arctia caia*; No. 2 in the second illustration), and will soon be turning to pupæ, from which will emerge those noble great moths, whose brilliant under wings make them, once seen, long remembered. It feeds on many plants besides the dead nettle (*Lamium alba*), the stinging nettle (*Urtica dioica*) being its principal food, and others such as

DRINKER AND ANGLE-SHADES.

a small ichneumon fly has learned to recognize his abode, and a very large percentage of the admiral caterpillars fall a prey to this noxious little parasite. We have now come out into the road again, and on a small piece of waste land just outside the copse three orange-tip butterflies sport themselves in the morning sunshine; in a few days' time the lanes will be alive with them, bright spots of moving orange everywhere. A

patch of dock arrests our attention; we stop in hopes of taking some more of the common woolly-bear caterpillars, this being quite as general a food-plant for the garden tiger moth as dead nettle. We look in vain, however; this is evidently not a favored spot for "tigers," yet the dock is eaten by some creature. On more careful search we find the cause of the damage; he is a smooth, velvety, green caterpillar, of the angle-shades moth by name.

The angle-shades caterpillar (*Phlogophora meticulosa*; marked No. 3 in the third picture) has two forms—one the green, which we have just found, the other a brown-colored one (marked 2). The brown form feeds at night, sheltering at the roots of grass, etc., by day. The reason of this is, of course, that the brown caterpillar would be so obvious on its green food-plant by day that it would immediately fall a prey to any passing bird; the green form harmonizing with the green leaves permits the former to feed by day in comparative safety. There goes a butterfly we all know—the peacock, and a fine example, too. Notice when he flaps his wings their under side is of a dark black-brown color. This is because he has to hibernate in old barns, hollow trees, etc., where if he had gaudily-colored under-wings he would soon be betrayed. The peacock (*Vanessa io*) is a most distinct butterfly, and is perhaps one of the most generally known of any, a fact probably accounted for by the prominent eye-like spots on the wings (hence its name peacock) and the general richness of its coloration. There is another very well-known butterfly that with great good fortune we might come across to-day—the clouded sulphur (*Colias edusa*) is the one I mean. It seems very doubtful, however, as to how many of those examples seen in England in the spring have hibernated in this country. Probably by far the greater number of them are fresh immigrants from the Continent. After a very large influx during the previous year it is possible, however, that a few may manage to find a very sheltered spot, and thus survive the ordeal of our wet winter. That white butterfly over there looks considerably larger than any others we have seen. Surely it is something fresh! Yes, that is the large white (*Pieris brassicae*; No. 4 in the first illustration), and, by the black spots on the fore wings, it is a female. See! she has settled, and you can see her well. The male has only a black tip to the anterior wings, those black spots not being represented. It is sometimes very common, is this white, the caterpillars doing an immense amount of damage to cabbages (their favorite food-plant); hence it is often called the cabbage white. The caterpillar has a similar kind of enemy as the red admiral has, however, and a large percentage of them are always killed by ichneumon flies. By the irony of fate they are not thus exterminated until they are practically full fed, or even until they are pupæ, thus being allowed to complete their devastation on the cabbages before their death. It also feeds on nasturtium, rape, and on a few other low-growing plants.

There is a white I have never taken, known as the Bath white. It is not really an indigenous species,

is the caterpillar of the drinker moth (*Odonestis potatoria*; No. 1 in the third picture), and is to be generally found sitting on grass stems in that manner in late spring; it is a very generally distributed species. But what is the time, I wonder? It is 1.30; so, if our hostess, with whom we have been so well entertained, will excuse us, we will return.—Country Life (London).

[Concluded from SUPPLEMENT No. 1594, page 25543.]

INSECTICIDES: THEIR PREPARATION AND USE.*

6. Arseniate of Lime.

White arsenic and lime may be made to combine, forming an arsenite of lime that is practically insoluble in water.

TORTOISESHELL AND RED ADMIRAL.

The poison may be prepared in either of two ways. What is known as the Kedzie formula is as follows:

"Boil two pounds of white arsenic and eight pounds of salsoda for fifteen minutes in two gallons of water. Put into a jug and label 'poison' and lock it up. When ready to spray, slake two pounds of lime and stir it in forty gallons of water, adding a pint of the mixture from the jug."

The other method is to boil together arsenic, lime, and water for a full half hour in the following proportions:

White arsenic 1 pound
Lump lime 4 pounds
Water 4 gallons

Then dilute to 200 gallons of water before applying to foliage.

These preparations have become very popular in the past few years, and deservedly so. White arsenic is cheap and consequently is in very little danger of adulteration, so that one is almost certain of the strength of his mixture when using this poison. Care must be taken, however, to use fresh slaked lime of good quality.

Before being diluted for use, the mixture should be passed through a coarse cloth or sieve, to take out the lumps that would otherwise clog the spraying nozzle.

7. London Purple.

London purple is a by-product in the manufacture of aniline dyes and has for its active principle arsenite of lime. It also contains some free arsenic, lime, coloring matter, and other impurities. The amount of arsenic present is subject to considerable variation, but will usually range between 40 and 55 per cent. As there is often considerable soluble arsenic present, it is always best to use a pound or two of freshly slaked lime with every pound of the poison if used in water.

This poison is finely divided and remains in suspension in water much longer than Paris green does and it usually sells at about two-thirds the price of that poison. It seems to be going into disfavor because of its variable composition and the danger of its burning foliage. It is also considered somewhat less effectual in killing insects than is Paris green or Scheele's green. It should compare favorably, however, with the prepared arsenite of lime in its power to kill insects, and there is little danger that it will be adulterated, as it is a waste product.

Apply either wet or dry in the manner and in the same proportions as are previously recommended for Paris green, being sure to add a pound or two of freshly-slaked lime for each pound of poison if used as a spray.

8. Bordeaux Mixture and the Arsenites.

Bordeaux mixture is a fungicide and is the substance most often used for the destruction of fungous diseases that attack the surface of the plants. It has been found to be of value for use against flea-beetles, and the writer also demonstrated its value a number of years ago as a medium in which to spray Paris green or London purple. These poisons can be used

very strong in this mixture without injury to foliage and they do not in the least lessen its effect as a fungicide. Such a mixture will destroy both insects and fungi with one application.

Bordeaux mixture may be prepared as follows: Take of:

Copper sulphate 4 pounds
Quicklime 4 pounds
Water 45 gallons

Dissolve the copper sulphate in a gallon of hot water, slake the lime in another gallon of water, and then add the milk of lime slowly to the copper sulphate solution while the latter is being constantly stirred. Then add 43 gallons of water.

If insects are to be killed at the same time, add to the above quantity of Bordeaux mixture one-third pound of London purple, Paris green, or Scheele's green, or two pounds of arsenate of lead.

9. White Hellebore.

Hellebore, as obtained from drug stores, is a light, yellowish-brown powder. It is a vegetable poison and is obtained by pulverizing the roots of a European plant *Veratrum album*. It is not as poisonous as the arsenites and consequently it is not as effective in the destruction of most insects, but it has its special uses. Slugs, which are the young of saw-flies, are particularly susceptible to its effects. The poisonous property is an alkaloid and it loses its virtue after being exposed to the air for a few days. For this reason it cannot be used where it is likely to remain long before being eaten, and it must be kept in tight receptacles and must not be kept too long before using. It is often useful for the destruction of insects upon plants containing fruit that will soon be used for food.

Dry applications are easily made upon low plants by making a small cheesecloth sack, through which the dust may be sifted lightly over the foliage. The best time to apply is in the evening.

In the wet way use:

White hellebore 1 ounce
Water 3 gallons

Apply as a spray in the evening.

10. Borax.

Used chiefly for the destruction of cockroaches. Spread the powdered borax upon bread, sweet potato, or banana peelings, or mix with sweetened chocolate, and place the bait where the cockroaches can get at it.

SUBSTANCES THAT KILL BY EXTERNAL CONTACT.

Substances in this group are chiefly used against insects that take liquid food from beneath the surface of the plant by means of a tubular rostrum or beak, but they may be used against many other soft-bodied insects with success. Insects having a hard outer crust to their bodies resist these substances and are not easily killed by them. If insects are covered with a powdery or cottony material, the insecticide will have to be applied with considerable force to cause it

1. CLOUDED SULPHUR.

5. LARGE TORTOISESHELL.

3. MALE BRIMSTONE.

4. VANESSA CARDUI.

to penetrate to the body. Applications must always be thorough, because only those insects will be killed that have the substances thrown upon them.

11. Soap.

The ordinary soft soaps and laundry soaps have long been used for the purpose of killing vermin on plants and animals, and they have considerable insecticidal value, particularly for the destruction of very

OAK-EGGAR AND LAPPET CATERPILLARS.

but a friend of— Look! a painted lady! You see it? There, by that humble-bee. Ah! it is off, alarmed, I fear, by my voice; but even a fleeting glance at such an old friend is delightful. It is the *Vanessa cardui* of the lepidopterist, and in certain years is by no means rare—in fact, sometimes prolific. What is this? Some large caterpillar at rest upon a tall grass blade, and not unlike an oak-eggar in general shape? That

* Abstract of a monograph by C. P. Gillette, published by the Agricultural Experiment Station of Colorado Agricultural College.