into the form of an Appendix—to be "skipped" at discretion by the general reader.

APPENDIX TO THIS CHAPTER.

Osten Sacken has repeatedly complained—and with very great justice too—of the exceedingly slovenly manner in which certain European authors have attempted to define and limit the multiplicity of new Cynipidous genera which they have thought fit to establish.* (*Proc. Ent. Soc. Phil.*, IV. p. 338, etc.). In our paper on *Cynips* (*Ibid.*, II. pp. 468–9 and 477–8) will be found, first, the characters which in our opinion separate *Cynipidæ* from *Figitidæ*, and secondly those which separate the Gall-making Gall-flies (*Cynipidæ psenides*) from the Guest Gall-flies (*Cynipidæ inquilinæ*). We will now give a Synoptical Table of those genera of *Cynipidæ psenides* found in N. A., which we consider to be sufficiently distinct to be classified as anything more than subgenera. In such matters as these, opinions of course will differ; but we have always thought that a good reliable Synoptical Table of genera is worth far more to the scientific student than one hundred times the same space occupied with mere generic circumscriptions, full of tautology and indefinite platitudes.

N. A. GENERA OF CYNIPIDÆ PSENIDES.

A. The second abdominal joint (counting the peduncle as the first) very large; the rest quite small and sub-equal.
  1. Ventral valve female moderate.....Cynips, on Oak.
  2. Ventral valve female enormously elongate, horny and shining.....Rhodites, on Rose.

B. The 2d abdominal joint moderate; the rest smaller and sub-equal. (Ventral valve female nearly as in *Rhodites*).....Tribalia, on Potato.

C. The 2d and 3d abdominal joints large, the 3d rather smaller than the second; the rest much smaller and sub-equal.
  1. 3d joint of antennæ longer than 4th.....Diastrophus, on *Rosaceæ*.
  2. 3d joint of antennæ shorter than 4th....Antistrophus n. g., on *Compositæ*.

D. Abdominal joints 2—7 sub-equal.....Ibalia, habits unknown.

ANTISTROPHUS, n. g.

Infests *Lygodesmia* (Family *Compositæ*) and differs as follows from *Diastrophus*, a genus infesting Bramble (*Rubus*) and occasionally the allied *Potentilla* (Family *Rosaceæ*):—1st. The 3d joint of the antennæ is much shorter than the 4th, whereas not only in *Diastrophus*, but in all other *Cynipidæ* known to us, joint 3 is longer, and often very much longer than joint 4. 2d. Both transverse veins in the front wing are fully as slender as the other veins, almost entirely colorless as well as the other veins, and not margined by any cloud whatever. 3d. The radial area is more elongate, but otherwise similarly shaped; and as in *Diastrophus cuscutæformis* o. s. (but not in *D. nebulosus* o. s.) the areolet is obsolete.

Antistrophus l. pisum, n. sp. ♀ Black. *Head* opaque, confluently and almost microscopically punctate, the face with very fine and short appressed pubescence; color, a dark rufo-sanguineous, very rarely on the occiput verging upon black. Antennæ 4–5ths as long as the body, 13-jointed, joint 4 longer by ½ than joint 3, joints 5—12 very slowly shorter and shorter, joint 13 as long as 11 and 12 put together; the two basal joints almost always black, the rest of a dark rufo-sanguineous color. *Thorax* opaque, confluently and almost microscopically punctate; the parapsidal grooves distinct and acute, the dorsal one obsolete on its anterior ⅛, and with an abbreviated longitudinal groove on each side of it, extending from the collare half way to the scutel. Scutel large and inflated, directed upwards and backwards, its tip widely rounded and with a slight medial emargination; the normal basal foveæ shallow and almost confluent, and covering about ½ of its upper surface. Collare very often, and sometimes the pleura and mesonotum, and occasionally the tip of the scutel, more or less rufo-sanguineous. *Abdomen* shining and polished; "ventral valve" rectangular at tip, with only a very minute apical thorn, thin and semitransparent and of a pale rufous color. "Dorsal valve" distinct, but never showing the ovipositor projecting from its tip. *Legs* bright rufo-sanguineous. *Wings* hyaline; veins and cross-veins scarcely tinged with brown; the radial area fully thrice as long as wide, with the 2nd transverse vein attached to it scarcely 1-6th of the way to its tip. Cubitus obsolete at its origin from the 1st transverse vein. All the longitudinal veins nearly, but not quite, attaining the margin of the wing.—Length ♀ 0.12—0.14 inch.

The ♂ differs from ♀ only as follows:—1st. The head is scarcely ever, and the thorax never, tinged with rufo-sanguineous. 2nd. The antennæ are fully as long as the body, 14-jointed, joints 1—4 as in ♀, joints 5—13 very slowly shorter and shorter, joint 14 a trifle longer than 13. 3rd. The legs are of a darker and duller color, and the hind tibiæ are obscurely tinged with dusky towards their tips.—Length ♂ 1.10—0.11 inch.

Described from 29 ♂, 34 ♀, which came out May 12th—26th, 1869, from galls kindly sent us in the preceding March by E P. Austin of Omaha, Nebr. We had previously bred a few specimens ♂ ♀ of the same insect in the spring of 1868 from galls gathered by ourselves on the Plains of the West from the very same plant. According to Dr. Asa Gray (*Manual*, 4th edition, page xcv.) this plant also grows in Wisconsin, where no doubt the same galls may be met with upon its stems.

* Giraud, as stated by Osten Sacken, reared what he has described as a *Diastrophus* from a gall growing on the Compositous plant *Centaurea scabiosa*. (*Verh. Zool. Bot. Gesellsch. Wien.*, 1859, p. 368.) We strongly suspect that this gall-fly belongs in reality to our new genus *Antistrophus*. The genus *Phanacis* of Foerster, of which a single species, *Ph. centaureæ*, has been "reared from the stalks of *Centaurea scabiosa*" by that author, as quoted by Osten Sacken, is apparently a guest-fly, and is probably inquilinous on Giraud's so-called *Diastrophus*, which was described three years after Foerster published. (See *Verh. d-Rheinl. Vereins fur Naturk.*, XVII, p. 145, 1856.)

CABBAGE BUTTERFLIES.

BY CHAS. S. MINOT, BOSTON, MASS.

There is a certain group of butterfles known, scientifically, by the name of *Pieris*, to farmers as "Garden Whites" or "Cabbage butterflies." They are easily recognized by the following characters: The wings are generally white, with inconspicuous black markings, and occasionally with green or yellow underneath; they are very broad and have no scallops or indentations in the margin; the hindwings in outline resemble an egg. "The feelers (palpi) are rather slender, but project beyond the head; the antennæ have a short flattened knob. Their flight is lazy and lumbering. The caterpillars are nearly cylindrical, taper a little towards each end, and are sparingly clothed with short down, which requires a microscope to be distinctly seen. They suspend themselves by the tail and a transverse loop, and their chrysalids are angular at the side and pointed at both ends." (Harris).

This genus is interesting, though disagreeably so, to every farmer, for the different species are very destructive to various vegetables: among others cabbages, nasturtium, mignionette, cauliflowers, turnips, and carrots. We propose now to notice only two of the species, as that number will serve to indicate the habits of the whole genus—which every farmer should be familiar with, so that he may be able to recognize and destroy such dangerous foes.

The first species we shall mention is the Rape Butterfly (*Pieris rapæ*, Schrank, Fig. 48). This insect has been the occasion of some little speculation and great interest to our New England and Canadian entomologists, inasmuch as

[Fig. 48.]

Colors—Black and white.

it has been introduced to this country from England, and is probably one of the most perfect instances on record of any insect being imported from one country to another and becoming completely naturalized in its new quarters. There does not seem to be the slightest doubt that this is the English species. It was probably introduced in 1856 or '57. It was first taken in Quebec in 1859, and in 1863 it was captured in large numbers by Mr. Bowles in the vicinity of that city. As the eggs are laid on the undersides of leaves, it was probably introduced in this form, the refuse leaves being thrown out of some ship; after which the larvæ hatched, and finding themselves in the neighborhood of their food, ate and flourished. Being, moreover, hardy little fellows, they were perfectly able to endure a change of climate. In 1864 it had spread about forty miles from Quebec as a centre; in 1866 it was taken in the northern parts of New Hampshire and Vermont; in 1868 it had advanced still farther south, and was seen near Lake Winnepesaugee; and finally this last summer it was taken around Boston, Mass., and a few stray specimens in New Jersey. There seems to be no doubt that this destructive insect will, in a few years, spread over the whole of temperate North America; for the other species of the genus have an extensive geographical range, and not being particular as to its food, it will have no difficulty on that score. Indeed, the larva and pupa seem to have an unusual power of accommodating themselves to circumstances,—for instance, Mr. Curtis, in his *Farm Insects* of England, states that the caterpillars have been found feeding on willow.

Now let us look at the larva (Fig. 49 *a*), and its habits. It is one and one-half inches long; pale green, finely dotted with black; a yellow stripe down the back, and a row of yellow spots along each side in a line with the breathing holes. In England and around Quebec it has done immense damage to the cabbages and other Cruciferæ (*Cress* Family) by boring into the very heart of the plant, instead of being content with the less valuable outer portion, as some other species are. On this account the French call it the "Ver du Cœur," or Heart-worm. When about to transform, it leaves the plants on which it has been living, and fastens itself on the underside of some stone, plank, or fence-rail, where it changes into a chrysalis in the middle or latter part of September, and in this stage it hybernates, producing, in New England at least, the perfect insect early in April. The chrysalis or pupa (Fig. 49 *b*), is variable in color, being sometimes yellowish-brown or yellow, and passing thence into green, speckled with minute black dots. The brood of butterflies that emerges from the pupa state in the spring lays eggs shortly afterwards, and these eggs produce caterpillars, which in their turn change to chrysalids in June, and in seven or eight days more the butterfly appears, which again lays its eggs for the second brood, which, as before stated, hybernates in the pupa state.

[Fig. 49.]

Colors—(*a*) pale green; (*b*) yellowish-brown.

In the perfect butterfly the body and head are black and the wings white, marked with black as follows: In the female (Fig. 48) a small space

[Fig. 50.]

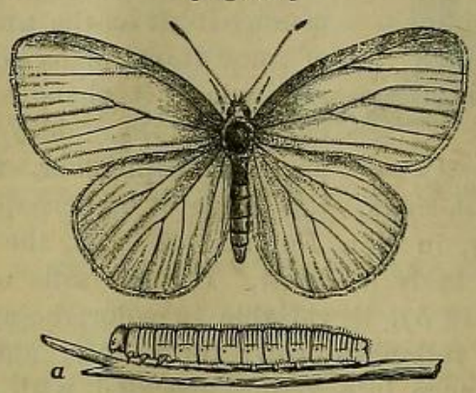
Colors—Black and white.

at the tip and three spots on the outer half of the front wings and one spot on the hind wings; beneath one spot on the front wings, but none on the hind wings, which are commonly yellowish, sometimes passing into green. The male (Fig. 50) has only one spot above and two beneath on the front wings, and a black dash on the anterior edge of the hind wings. There is a variety of the latter sex which has the same markings, but differs from the type in the ground color being canary yellow. Curiously enough, this variety has been taken both in this country and in England.

These butterflies occasionally assemble in great numbers. At one time a flight crossed the English channel from France to England, and such was the density and the extent of the cloud formed by the living mass, that the sun was completely obscured for a distance of many hundred yards, from the people on board a ship that was passing underneath this strange cloud.

The Potherb Butterfly (*Pieris oleracea*, Boisd., Fig. 51), is the next species to be described.

[Fig. 51.]

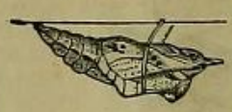


Colors—Black and white; (*a*) green.

It has a very wide range, reaching rarely as far south as Pennsylvania, extending eastward to Nova Scotia, and at least as far west as Lake Superior, while in the north it is found as high up as the Great Slave Lake in the Hudson's Bay Company's territory. This butterfly has a black body; the front wings are white, marked above with black at the base, along the front edge, and at the tip; the hind wings are white above and lemon-yellow beneath, but without markings except a few black scales at the base.

About the last of May numerous specimens of this species may be seen over cabbage, radish or turnip beds, or patches of mustard, where, on the underside of the leaves, it deposits its eggs. These are yellowish, nearly pear-shaped, longitudinally ribbed, and one-fifteenth of an inch in diameter, and are laid seldom more than two or three together. In a week or ten days the young caterpillars are hatched; in three weeks more they have attained their full growth, which is an inch and one-half long. Being slender and green (see Fig. 51, *a*) they are not readily distinguished from the leaves on which they live. They taper a little toward each end, and are densely covered with hairs. They begin to eat indiscriminately on any part of the leaf. When they have completed the feeding stage they quit the plants and retire beneath palings, etc., where they spin a little tuft of silk, entangle their hindmost feet in it, and then proceed to form a loop to sustain the front part of the body in a horizontal or vertical position. Bending its head on one side the caterpillar fastens to the surface, beneath the middle of its body, a silken thread, which it carries across its back and secures on the other side, and repeats this operation until a band, or loop, of sufficient strength is formed. On the next day it casts off the cat-

[Fig. 52.]



Colors—Green, white and black.

erpillar skin and becomes a chrysalis (Fig. 52). This is of a pale green and sometimes of a white color, regularly and finely dotted with black; the sides of the body are angular, the head is surmounted by a conical tubercle, and over the forepart of the body, corresponding to the thorax of the included butterfly, is a thin projection, having in profile some resemblance to a Roman nose. The insect remains in this stage for ten or twelve days, when the butterfly appears.

In the last of July and first of August, these insects may be seen in large numbers depositing their eggs for a second brood, which wintering in the pupa state, produces the perfect insect the following May.

This butterfly varies considerably. There are never, we believe, perfectly white specimens, though often nearly so. Again, some specimens have very faint indications of spots arranged as in *P. rapæ;* but on the underside are found the widest limits of variation, for not only do the tips of the front wings become distinctly greenish, or lemon-yellow, and the veins of that portion bordered with grayish scales, but the hind wings may also have the ground color distinctly greenish, lemon-yellow, or whitish, and the veins display gray scales on each side.

By taking advantage of the habits of these insects, they might be nearly exterminated. If boards are placed among the infested plants, about two inches above the ground, the caterpillars when about to change will resort to them, and there undergo their metamorphoses. They may then be collected by hand on the underside of the boards and destroyed. As the butterflies are slow fliers, they may be taken in a net and killed. A short handle, perhaps four feet long, with a wire hoop and bag-net of muslin or mosquito netting, are all that are required to make this useful implement, the total cost of which need not be more than fifty or seventy-five cents. The titmouse is said to eat the larvæ, and should therefore be protected and encouraged.

The Southern Cabbage Butterfly.

[As the Southern representative of the genus, we will briefly add an illustrated account of the Southern Cabbage Butterfly (*Pieris Protodice*,

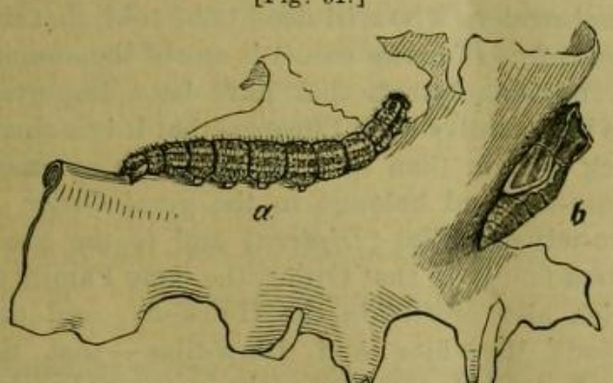
Boisd.) Mr. S. H. Scudder, from an examination of a large number of specimens, found that

[Fig. 53]

Colors—Black and white.

this butterfly enjoys a wide geographical range, "extending from Texas on the southwest, Missouri on the west, and the mouth of the Red River of the North on the northwest, as far as Connecticut, and the Southern Atlantic States on the east."* But while the species is scarce in the more northern States, it abounds in many of the southern States, where it takes the place of the species described in the above paper. It often proves exceedingly injurious, and we learn from one of our Mississippi exchanges that "there were last year thousands of dollars' worth of cabbages devastated and ruined by worms in the neighborhood of Corinth." We are furthermore told, that cabbages could not, in consequence, be had there even at ten cents per head. The "worm" referred to, was doubtless the species under consideration. It abounds in many parts of Missouri, and especially in the truck gardens around large cities, where it proves quite destructive to the cabbages.

[Fig. 54.]



Colors—(*a*) Greenish-blue, yellow and black; (*b*) light bluish-gray.

The larva (Fig. 54 *a*), may be summarily described as a soft worm, of a greenish-blue color, with four longitudinal yellow stripes, and covered with black dots.† When newly hatched it is of a uniform orange color with a black head, but it becomes dull brown before the first moult, though the longitudinal stripes and black spots are only visible after said moult has taken place.

The chrysalis (Fig. 54 *b*), averages 0.65 inch in length, and is as variable in depth of ground-color, as the larva. The general color is light bluish-gray, more or less intensely speckled with black, with the ridges and prominences edged with buff or with flesh-color, and having larger black dots.

[Fig. 55.]

Colors—Black and white.

The female butterfly (Fig. 53), as was stated in our last number, (p. 60) differs remarkably from the male which we represent at Figure 55. It will be seen, upon comparing these figures that the ♀ is altogether darker than the ♂. This sexual difference in appearance is purely colorational, however, and there should not be the difference in the form of the wings which the two figures would indicate, for the hind wings in our ♂ cut, are altogether too short and rounded.

This insect may be found in all its different stages through the months of July, August and September. It hybernates in the chrysalis state. We do not know that it feeds on anything but Cabbage, but we once found a ♂ chrysalis fastened to a stalk of the common nettle, (*Solanum carolinense*) which was growing in a cemetery with no cabbages within at least a quarter of a mile. Before concluding this article, we cannot too strongly urge upon our western readers to do all in their power to prevent the advent of the Rape Butterfly in their midst. It is more to be dreaded than any of the others, and by stringent measures may easily be prevented from gaining a foot-hold in any locality. Be on your guard!—Ed.]

* See Proc. Bost. Soc. Nat Hist., VIII, 1861, p. 180.

† We annex a full description of this larva for the benefit of our scientific friends: Average length when full grown 1.15 inches. Cylindrical. Middle segments largest. Most common ground-color green verging onto blue; sometimes clear pale-blueand at others deep indigo or purplish-blue. Each segment with six transverse wrinkles, of which the first and fourth are somewhat wider than the others. Four longitudinal yellow lines, each equidistant from the other, and each interrupted by a pale blue spot on the aforementioned first and fourth transverse wrinkles. Traces of two additional longitudinal lines below, one on each side immediately above prolegs. On each transverse wrinkle is a row of various sized, round, polished black, slightly raised, piliferous spots; those on wrinkles one and four being largest and most regularly situated. Hairs arising from these spots, stiff and black. Venter rather lighter than ground-color above, and minutely speckled more or less with dull black. Head same color as body; covered with black piliferous spots, and usually with a yellow or orange patch each side —quite variable. The black piliferous spots frequently have a pale blue annulation around the base, especially in the darker specimens.